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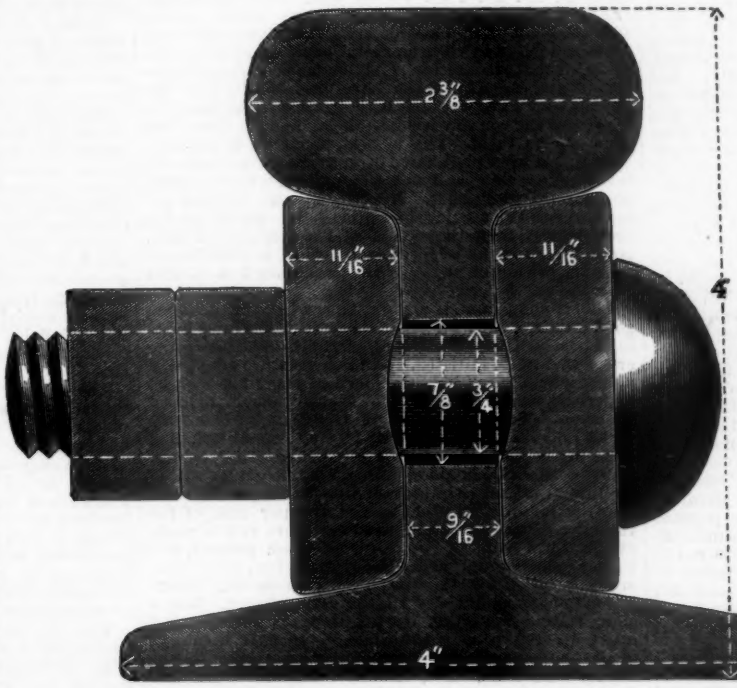
## Contributions.

### STANDARD RAIL SECTIONS.

Referring to the article on rail sections in the RAILROAD GAZETTE of Sept. 24, taken from *Engineering*, permit me to remark that I hope no American railway official will adopt all the principles recommended by Mr. C. P. Sandberg, Inspector in England for the Swedish and Norwegian Government railways, without reflection.

His advice upon the form of rails is well enough; but the position of the fish-plates in the illustration of his proposed form of rail is wrong. One of the most important and valuable uses of fish-plates is to hold the ends of the rails truly and firmly in line with each other at the joints. This can only be surely accomplished by those which are so shaped that they will touch and press against the sides of the vertical web of the rail, throughout the whole length of the plate, as represented in the accompanying diagram. Experience shows that fish-plates of the shape shown in the illustration of Mr. Sandberg's form of rail and fish-joint will not remain permanently in the position designed for them; they have an invariable tendency to shift their position and incline inwards at the top or bottom towards the vertical web. The consequence of this disarrangement of the plates is that the rails are not firmly held in line at the ends, and the support which should be furnished by the plates is chiefly supplied by the fish-plate bolts, upon which a greatly increased strain is brought by the tendency of the pressure on the top of the rails, caused by moving trains, to force the inclined plates outwards.




In practice it is found that a form of rail section not curved so much in the angles at the junction of the vertical web with the lower flange and under the head of the rail, as in Mr. Sandberg's form, is far better. The Hudson River Railroad Company's steel rails of 56 to 60 lbs. weight per yard, made by John Brown & Co., of Sheffield, England, are a fine example of this more judicious form. The angle at the corner under the head is a right angle very slightly rounded, only sufficiently so to make it roll well. The fish-plates in use with this rail fit close up to the vertical web and hold the rails in perfect alignment at the joints. The plates never yield their position and very little strain is thrown on the bolts. The rails have been nearly two years in use, yet no bolts appear to have yielded and no joints are out of line or worn in the least perceptible degree.

The size of the bolt shown in the illustration of Mr. Sandberg's form of rail and joint as 9-16 of an inch in diameter is less than the size most in use in this country, but the diameter of the bolt hole in the rail, 1⅛ of an inch, is excessive and unnecessarily weakens the rail; ⅞ of an inch is quite sufficient.

The inspection tests recommended by Mr. Sandberg are only partially to be relied upon. They would detect cold-short iron rails, as under the falling weight they would be broken; but a great many very bad rails would stand his test and yet, when placed in the track of a railroad under a heavy traffic, would not last a year, owing to imperfect welding in the pile permitting lamination of the top layer of the rail, a defect more common in strong rails of fibrous iron than in weak and brittle ones. I would recommend a form of rail with right angles under the head slightly rounded, with fish-plates fitting closely between head and base, in contact with the sides of the vertical web throughout the whole length of the fish-plates, which should be not less than twenty inches long, secured by four ¾-inch bolts with oblate form under the head fitting into oblong holes ⅞ by 1⅛ of an inch punched in the plates; the object of the oblong shape being to prevent the screw bolt from turning while being screwed up. The holes in the rails should be ⅞in. by 1¼in. to allow for expansion and contraction motion. The bolts should each have two nuts, the object of the second nut being to act as a "jam nut," this being a more convenient and permanent device than any yet tried for preventing the joint from working loose.

Careful supervision of the manufacture of rails by a practical man who has had experience as a workman in rolling mills, is the surest way to secure good rails. He should be capable of selecting the most suitable qualities of pig iron, and supervise the puddling, piling heating and rolling processes. He should be well paid by the company employing him; he will then properly perform his duty and reject all unsuitable raw material, detect all imperfect workmanship in puddling, piling, heating and rolling, and thereby secure rails of such a quality as will rival steel in strength and wear twice as long as iron rails of careless and unskilful manufacture.

O. W. B.

### WHIPPLE ON BRIDGE BUILDING.

BRIDGE BUILDING. By S. Whipple, C. E. pp. 250. Printed by H. H. Curtis, Utica, N. Y. Sold by D. Van Nostrand.

This is a work of more than ordinary merit. It is eminently practical and theoretical. Mr. Whipple is an old bridge builder, and this work shows that he is also a theorist—an original thinker. He invented the well-known bridge which bears his name. His bridges are constructed on scientific principles, and his book shows that he is familiar with those principles, and hence his structures do not *happen* or *chance* to be well made. Mr. Whipple is evidently not a book-worm, or a book-maker, or a copyist. He presents his ideas clearly, but often in a novel way. He has a truly *practical* stroke with his pen.

An approximate method which is correct in principle is worth more to him than the most exact numerical calculation which has an erroneous element in its foundation,—and so it is with all truly practical men. It is often more important to be *correct* than *precise*; and often it is no more important to be both *correct* and *precise* than it is to be simply correct.

These ideas are well illustrated in the work before us compared with Col. Merrill's "Iron Truss Bridges."* In the latter work the strains and weights are computed *precisely* to the fraction of a pound, while in the former the computations are greatly shortened, although made on the same general principles, and the results are sufficiently *correct* for all *practical* purposes.

The two authors do not agree in the results of their comparison of different bridges. Col. Merrill did not analyze the Whipple Truss; but the Murphy-Whipple and Linville trusses do not differ essentially from it, and both these he makes heavier than the Post truss,—all having the same span, depth, number of bays, and load. But Whipple (page 182) concludes, as the result of his calculation, that his truss, the "Whipple," is lighter than Post's! It is true that Mr. Whipple is here an interested party, but we are of the opinion that a *correct, precise, theoretical analysis* will confirm his conclusion. But when two trusses made on different principles differ by only a few pounds, the superiority of one over the other must be established on other grounds. The heavier truss may be more cheaply made, and at the same price, or even at a somewhat increased price, may be more acceptable to corporations, the public, or even contractors. The *impressions* of persons often determine their choice, when *reason* would have made a different choice. We have known a particular thing, unimportant in itself, to determine a choice without much regard to cost. But a scientific man is not influenced by these considerations. He seeks the best arrangement and combination of parts under all the circumstances of which he has control; and in doing this the details of construction form a very important element of consideration. Mr. Whipple's book gives the result of his thought and experience upon these points. He has devoted several pages to plans and specifications of bridges of different spans, including many of the details of construction. He shows some of the best methods of splicing timbers and of fastening irons at joints.

He treats of the subject of ties and braces in reference to dead weight only, but of counter-ties and counter-braces in reference to *strength* and *stiffness*. There are so many views among the profession with regard to the true office of a counter brace and the duty it must perform when introduced, that it cannot be expected that his views will meet with universal assent. So far as mere strain is concerned, in a perfectly constructed bridge with parallel chords, under the action of a load moving without shock, he is undoubtedly correct, although he differs from some previous writers. Those who have studied the subject most critically have come to the same conclusion that he does. But as to other conditions, the problem has not been solved so satisfactorily. If to secure stiffness a strain must be put upon the counter-tie, it increases by so much the strain on the main tie, and by just so much is *damaging to strength*, if the structure is properly proportioned. This idea compels internal stresses for *stiffness*, which are worse than useless for *strength*.

With commendable frankness he admits his inability to settle certain theoretical difficulties. One of these is given on pp. 151–154. It is referred to here so as to call the attention of theorists to it. It is of little practical value, as the difference between the two modes of solution is small. But as a theoretical problem it possesses peculiar interest.

Much more might be said in favor of the general and special merits of this work, but to do full justice to it would require too long a notice. A careful perusal of the book itself will repay the student. DEV. WOOD.

ANN ARBOR, Mich.

*Reviewed on page 154, vol. I. of the RAILROAD GAZETTE.

—A railroad 250 miles long has recently been opened in Russia extending from St. Petersburg along the north shore of the Gulf of Finland to the Port of Helsingfors.

## Railroad Subsidies.

Discussions on points of constitutional law would be far more interesting were they not well-nigh interminable. We now have so many constitutions and so many courts to expound them, that perhaps the wonder is rather that a recognized result is ever arrived at, than that the process is a long one. Here is the legal-tender law. Rather more than a score of tribunals, State and national, have, we believe, since 1862, affirmed the constitutionality of this act; and yet the last decision in 1870 has cast the gravest doubts upon the correctness of all those which preceded it. This instance of the unc rtainty of the law is striking enough, but it is nothing to another and yet more recent one. Most persons have heard of the doubt entertained as to the constitutionality of the act authorizing towns and cities to aid in the construction of railroads which were to belong to private companies. It was asserted that this was an appropriation of public funds to private uses, and was not within the legitimate taxing powers of legislatures. For nearly twenty years the question has been incessantly argued by lawyers and decided by judges. In 1853 the Supreme Court of Pennsylvania, in the Sharpless case, unanimously affirmed the constitutionality of this class of acts. The court was then a strong one, and State after State accepted the law laid down by it. For years the question was looked upon as settled. Nothing could have been further from the truth.

The law in the case is perfectly simple; as usual, the difficulty lies in its application. The point is not uninteresting, and the judicial discrepancy arrived at is edifying in the last degree. All authorities agree that, in the absence of constitutional restrictions, a very large discretion rests in the legislature as regards the objects for which money may be raised for taxation. No taxes can, however, legally be imposed, except for public purposes; for a legislature, under the name of taxation, to take the property of one portion of the community and give it to another would, the courts say, be robbery and not taxation. The judiciary, however, they add, will be very loth to interfere in a matter thus reposed in the discretion of a co ordinate department—indeed, with one voice, judges all declare that not for worlds would they even seem to usurp an authority which does not belong to them. A tax to be declared unconstitutional, must, therefore, be so plainly, palpably, and grossly an appropriation of public money to private uses as to be a mere cover for fraud—in fact, a breach of trust so glaring as to be but a single step removed from robbery. So far, all is clear; there is not even a single dissenting voice. The abstract law being thus established, it only remains to apply it to the particular facts. Are railroads, the property of individuals, but subject to regulation by law public or private concerns? For years, court after court decided that the legislatures must settle this question; that if they declared railroads public uses they became so, and money raised by taxation might legally be applied to their construction. Practical evils ensued from this decision. Heavy municipal debts were everywhere incurred; certain towns and cities ruined themselves by building railways before they were needed; legislatures got lax and corrupt in parcelling out railroad subsidies; and so, finally, a change of popular feeling resulted, and this led to a great awakening of the judicial mind. The result, in a word, was that in certain of the States, of which Michigan is most noticable, the reasoning of a score of courts and the decisions of twenty years were pronounced wholly fallacious and wrong. A system sanctioned no less by time than by the authority of court upon court, which the popular mind had accepted, and upon the faith of which millions had been invested, was thus constructively declared to be such a gross, plain, and palpable appropriation of public means to private uses that no one could fail to see at first glance that it was nothing less than legalized robbery.

Such a statement of a legal complication seems scarcely credible. Of course it was not put in this blunt way, but this is the undisputed logic of the decisions. No exercise of the taxing power by the legislature will be adjudged void by the courts unless it presents a clear, indisputable infraction of the Constitution. The municipal aid acts, say the recent decisions, are unconstitutional; he who can may escape the logical inference. In Iowa, the question has been decided both ways. In Michigan, it has been decided one way only. These States, however, occupy a position somewhat akin to that of one reasonable juryman persecuted by his eleven intractable associates. It certainly does call for some courage in a court to decide that a question, which twenty similar courts had decided the other way, cannot admit of a doubt; but it is done, and, as the result of a discussion extending through half of the life of a generation, the question of the power of legislatures to authorize towns to aid in the construction of railroads is no more settled than is the authority of Congress to declare Government notes a legal tender.

So much for the legal aspect of the question. We had not intended to give so great a space to it, but the temptation to describe so curious a complication is not easy to resist. The practical, not the legal, solution of the question should be the real end in view. The popular feeling in regard to municipal aid to railroad construction is running as thoughtlessly in one direction now as it did in the other a few years ago. At present, the tendency is to cut the system up root and branch, just as not long ago it was to subsidize everything. The tide first turned in Pennsylvania and Ohio. The practice had there been pronounced constitutional. An amendment met the difficulty and put a stop to it, but not until one-half of each of those States was bankrupt. Iowa, less scrupulous, or perhaps more heavily burdened, next disgraced itself by a resort to judicial repudiation. The court which decided the law to be constitutional was turned out when the elections came round, and a new court was selected which declared the decisions of their predecessors to be no law at all. Illinois, following the example of Pennsylvania and Ohio, has engrafted inhibition into her new constitution, and Michigan has judicially arrived at the same result. Thus the case stands—the tendency being distinctly to a reaction from indiscriminate subsidizing to absolute inhibition.

After all, is this a practical way of dealing with a really important question? Every one concedes that the position of this country is exceptional—in fact, any reasonable being has but to look around to be forced to this concession. Railroads with us are an absolute necessity. In old-settled countries, of dense population, short distances, and good roads, they are comparatively matters of luxury. In Europe they are modern innovations—people always had got along without them, and could have continued to do so. It is wholly otherwise with us. The railway is our pioneer—it made the settlement of the country possible. Indeed we may be said to have no other roads. Our distances are railroad distances; practically we have no other machinery of intercourse, absolutely no other conveyance to our markets. All over the world municipalities or governments have been obliged to provide some means of intercommunication, and this is the one means adapted to our circumstances. Our potitical system, too, is based on the principle of local self-government; each subdivision is left to judge of its needs and to provide for them, instead of looking to the great central power for an initiative. For us, therefore, to say that, under no circumstances, shall town or city aid in railroad construction, is like saying that in Europe the highways sh uld always have been built and kept in order by private enterprise. Railroads, then, must be had by our people; if the law of supply and demand will produce them, well and good; if unaided private capital will build them, better and better; but railroads there must be. One might as well talk of having a city without streets.

Will our people, then, permanently accept these constitutional limitations, which render all localities absolutely dependent on private enterprise for a prime necessity of civilized life—if not for civilized life itself? For the present, undoubtedly they will. Many farms are still mortgaged, the town debts are not yet paid, population is moving away from excessive taxation, and not a few corner lots, once promising, are now valueless. The fathers have eaten grapes, and the teeth of the children are set on edge. Yet it by no means follows that grapes in moderation are a bad thing, or that moderation is impossible in one's consumption of grapes. The roads have been built, and the burden they have created may be one now heavy to bear; but the country has got them, and in time will grow up to them. The system, much as it has been abused, has been productive of more good than evil. It is the abuses, then, and not the system, which need to be reformed altogether. Nevertheless, we are now going through the regular slow process by which results are evolved from the action of large masses of men. Here, too, as in the temperance question, it is action and reaction, with each swing of the pendulum less violent than the one before.

The true medium, if any exists, is what the common good requires. An effort at this was last winter made in Massachusetts. The Board of Railroad Commissioners of that State initiated, and the legislature adopted, a policy which has at least the merit of being founded on experience and reflection. The system thus introduced is a simple one. Any town in the State, of less than 12,000 inhabitants, is authorized by a general law, and without the necessity of having recourse to the legislature, to subscribe in aid of railroad construction within its limits; all subscriptions of this nature, at any one time outstanding, must not exceed five per cent. of the valuation of the town, and no subscription can be made except by a vote of two-thirds of those present, and voting by ballot and under the registry law, at a town-meeting called for the purpose. This is all. There seems to be one difficulty in the arrangement. It is a mere statute limitation on taxation, not incorporated into the constitution of the State; as such, it is subject to all the dangers incident to popular manias and to legislative log-rolling. Yet, if once incorporated into the fundamental law, why would it not cut off all dangers of abuse, and secure to localities a great public need? If such restrictions had existed in Pennsylvania or Iowa, could their railroad bond difficulties ever have arisen? While indebtedness is limited to five per cent., bankruptcy is difficult; as long as a two-thirds vote is required, the exceptional character of the appropriation is recognized, and the rights of property are guaranteed.

No constitution is now complete without some sort of an article in relation to railways. The most elaborate attempt in this way, though a very crude one at the best, is found in the new constitution of Illinois. Michigan has already copied its provisions. In these articles, as we before remarked, absolute inhibition of municipal aid is laid down. This is hardly likely to last, and whenever it breaks down, it is to be hoped that regulation will next be attempted. Meanwhile, we would recommend the provisions of the Massachusetts law to the consideration of all legislators hesitating between the two extremes. It is necessary neither to be without a railroad system nor to plunge into the slough of bonded indebtedness. Upon the constitutional question we believe that the voice of the Supreme Court of Vermont is the next in order. This will, doubtless, add somewhat to the existing uncertainty, but will yet contribute to the grand result, if it forces the question on the popular mind for intelligent discussion and final settlement. On the whole, we decidedly hope that it will join itself to the minority, as by so doing it will in the most effectual way bring the question to an issue.—*The Nation*.

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—Mr. Nathan Hall, of Durham, Conn., in 1833, thanked God that he "lived in a hilly country where it was impossible to build railroads." To-day the cars of the Air Line Railroad run through the door-yard of his place, between his house and barn, and within four feet of his side door. The heirs have been awarded $8,000 which is nearly the actual value of the old stone house and the entire farm.

## The Iron Interest.

The manufacture of iron in Pittsburgh was commenced in the year 1813, by Christopher Cowan. This mill was intended to manufacture sheet iron, nail and spike rods, shovels and tongs, spades, scythes, hoes, axes, and a large variety of domestic hardware.

The second rolling mill was established on the banks of the Monongahela river, in 1818-19, and contained a train of eight-inch rolls, a nail factory, four puddling furnaces and rolls for rolling nail, plate or band iron. This is claimed to be the first mill in which puddling was successfully introduced in Pittsburgh. In the years 1824-25, no less than three large rolling mills—the Sligo, Juniata, and Dowlais—were erected, the first two named being yet in operation.

The machinery of the mills in Pittsburgh may be summed up as follows: number of boiling furnaces, five hundred and twenty-four; number of heating furnaces, one hundred and seventy two; nail, tack and spike machines, four hundred and ninety-seven; railroad spike machines, thirteen; steam hammers, sixty-nine; steam engines employed, one hundred and ninety-five; the steam hammers, of which twenty-six are of English make, twenty-two of Eastern, and twenty-one of Pittsburgh manufacture, vary in weight from five hundred pounds to sixteen thousand pounds. The largest of these steam hammers strikes a blow equal to sixty or seventy tons, are easily operated, and with such precision, by a skilful mechanic that the crystal of a watch may be touched and not broken. These are the tools used to forge the stupendous shafts employed in the ocean screw propellers.

The rolls employed in the mills of Pittsburgh are of various sizes. They vary in weight from five hundred pounds to ten tons. The large rolls are employed in the manufacture of plate iron. The plates rolled under these for naval use vary from ten to fifteen feet in length, by four in width, and from one and a half to three inches thick. Should occasion require, however, plates twenty feet long, four and six feet in width, and seven inches thick, can be made in these large plate mills, several of which have a capacity of eighty tons per week.

As an illustration of the immense power employed in reducing iron, it may be stated that the largest rolls draw between them a mass of heated iron varying from one to twelve tons, reducing it to a uniform thickness in less time than it takes to describe it.

The value of the annual products of the iron mills of Pittsburgh is estimated at twenty million dollars. The actual sales of the past year, as exhibited by the United States Assessor's books, aggregated sixteen millions, seven hundred and eight thousand, two hundred and eighty-nine dollars. In addition to this, there is to be taken into consideration the amount sold in eastern and western cities by the agents of Pittsburgh firms, of which we have no account, and which will probably aggregate four millions. This exhibit is made in a year in which the trade was depressed, the unsettled condition of the financial market having much to do with that state of affairs. In favorable seasons the value of the products will not fall short of twenty-four million dollars.

There are now seven furnaces in successful operation, the largest of which has a fourteen feet bosh, fifty feet stack, and a capacity of one hundred and seventy-five tons per week. The total capacity of the seven furnaces is estimated at fifty-four thousand tons per annum, and the actual production at forty-eight thousand tons The sales of pig iron in this market range from one hundred and fifty thousand to one hundred and eighty thousand tons per annum, which, added to the home production, will give a fair idea of the consumption of raw irons by the mills. It is safe to say that in active seasons the amount of iron worked up in the mills of Pittsburgh exceeds *one thousand tons per day*.

The first patent nail machine was introduced into Pittsburgh in 1814, and was operated in Mr. Cowan's mill. Previous to that time "wrought nails" were in general use. In the progress made in this branch of iron manufacture from that period to the present time, Pittsburgh enjoys an enviable distinction. From the single nail machine in 1814 have grown up ten large nail manufactories, operating four hundred and sixty machines, and employing about two thousand five hundred persons. The value of the products of the nail and spike manufactories is estimated at three millions and a half of dollars.

Next in importance in the iron trade, to the manufacture of iron and nails, is the foundry business. The first foundry was erected in Pittsburgh in 1803, on the site of the present postoffice. It was first employed in the manufacture of cast iron pots, kettles, domestics utensils, and mill irons, but in a few years was called upon to cast cannon balls for the government. In 1811–12 the first cannon made west of the Allegheny Mountains were turned out of the Pittsburgh foundry, and the establishment was kept busily employed in furnishing the government with cannon and shot until the close of the war in 1814. The first water pipe and the first rolls were made at this foundry. It was in this foundry that the valuable invention of making chilled rolls was discovered by a moulder, James Harley. This invention gave to Pittsburgh almost an entire monopoly of the business of making chilled rolls, this city furnishing seven-eighths of all the rolls of that description in use in the country. At the present time, Pittsburgh sends all over the Union trains of rolls, fitted complete, and ready to make all kinds of iron when erected, the whole sometimes having a solid bed plate of one piece, from twenty-three to thirty feet long. The second foundry was established in Pittsburgh in 1810, and was employed in the manufacture of light articles, such as hinges, buckles for saddlery, and small brass castings.

The total number of foundries in the city is forty-eight. A single establishment boasts a cupola with a capacity of fifty tons, which melts metal at the rate of twelve tons per hour, the molten metal being conveyed from the cupola to the pit on a railway track. Another foundry employs six furnaces and two cupolas, with a

total capacity of one hundred and eighty-five tons. The largest furnace melts forty tons at a single heat. One establishment employs fifteen cranes, and works up eight thousand tons of metal annually.

The products of these foundries embrace everything in the range of mill castings, cannon, plows, machine castings, chilled wheels and rolls, hollow ware, stoves, grates, and domestic hardware. The aggregate production of these establishments amounted in value, last year, to upwards of four millions of dollars. The number of men employed is estimated at twenty-five hundred. The increase in the foundry business during the past twelve years is equal to 50 per cent. on what it was in 1858.

In the three branches of the iron trade referred to in the foregoing, namely: the manufacture of merchant iron, nails and castings, is employed a capital of not less than $50,000,000. The aggregate value of their annual products will not fall below $28,000,000.

In the distribution of the products of the iron mills and foundries of Pittsburgh, the West comes in for four-fifths of the whole amount. Ohio is the heaviest patron, Illinois is next, and Missouri, Indiana and Michigan follow in order. Nearly all the Territories east of the Pacific coast receive their iron supplies from this city.—*Pittsburgh Chronicle*

## The Gauge for "The Railways of the Future."

BY R. F. FAIRLIE, ESQ.

[Read before the British Association, at Liverpool, Session 1870.]

The object of this paper is to show in what manner, and to some extent in what degree, the cost of the construction and maintenance of railways is affected by the gauge on which they are built; and by what means it would be possible at once to increase the dividends of shareholders, and to extend the countless advantages railways afford to all parts of the habitable globe, however thinly peopled or unproductive. It will be in the recollection of many that the question of the proper gauge for railways was once a matter of earnest dispute, and that what was called the "battle of the gauges," as between broad and narrow, was fought with desperate vigor and with no decided result. Each party of belligerents retired from the contest with heavy pecuniary loss; but neither would allow that the other had been the victor. The result was that the construction of each gauge was pushed forward by those who were interested in it; and thus it befell that a broad gauge line was carried into the northern districts, from which its subsequent removal was the best proof that it ought never to have been taken there.

Although the controversy to which I have referred was conducted with singular ability, and at a very lavish expenditure of the money of confiding shareholders, it is curious to observe that those concerned in it seem never to have taken into account the relative economy of the plans that they respectively advocated. The consideration of this most important element in the question would have thrown upon it a totally new light. But the very word was at that time unknown to the railway world, and the thing which the word signifies has scarcely yet gained its due share of consideration. Had it done so, the present paper would have been unnecessary; for it would have been proved, years ago, that while a narrow gauge is infinitely less costly than a broader one, its capabilities in respect of power and speed are fully equal to the wants of the country. If this had been known, we should not have seen, as at present, large districts deprived of all prospects of railway accommodation; and thousands of shareholders regretting the loss of that return to which their expenditure has fairly entitled them.

Apart from the important question of economy, the carrying capacity of gauges of less than 4ft. 8½in. has never yet been considered in its true light. It has been hastily assumed that a line of narrower gauge than this would be very limited both in its carrying power, and also as regards the speed at which trains could be run; and it has been argued that the saving in cost would be too small to render it desirable to make a change. It is not my purpose to advocate such a change in Great Britain, where a 4ft. 8½in. gauge is actually established and at work, and where it affords the necessary facilities for the speed of sixty or seventy miles per hour that are actually run over it; but only to take the conditions of English railway traffic as an illustration of my general arguments. It is admitted that the proportion of non-paying to paying weight in passenger trains is as much as 20 to 1, and in goods trains, exclusive of minerals as much as 7 to 1. This terrible disproportion is probably due to the system of management pursued; but in a far greater degree to the gauge. The dead weight of trains conveying either passengers or goods is in direct proportion to the gauge on which they run; or, in other words, the proportion of non-paying to paying weight (as far as this is independent of management) is increased exactly as the rails are farther apart, because a ton of materials disposed upon a narrow gauge is stronger as regards its carrying power than the same weight when spread out over a wider basis. In proof of this proposition I need only cite the case of the Festiniog Railway, with its gauge of 1ft. 11½in. The wagons used upon it for carrying timber weigh only 12 cwt., and they frequently carry a load of over 3½ tons at a speed of twelve miles an hour. In other words, these wagons carry as much as six times their own weight, whilst the best wagons on the ordinary English narrow gauge do not carry as much as twice their own weight. The good management of the London & Northwestern Railway is so universally admitted that it will seem almost presumptuous to select this line as an illustration of the faults of the existing system. I have, however, selected it, because its management is such that its shortcomings must be wholly due to its construction; and I shall proceed to show that, if its gauge were 3ft. instead of 4ft. 8½ in., its goods traffic could be hauled at half the present cost, with half the present motive power, and in such a way as to reduce the present tonnage over the road by one-half, and to remove the necessity for the heavy expense that is now being incurred in the construction of a third line of rails. I am perfectly prepared for the incredulity with which these statements will at first be received; but I shall prove their correctness by figures that cannot err.

The goods and mineral traffic on the London & Northwestern Railway for a single year amount to about fifteen millions of tons. I will assume that five out of these fifteen million tons are minerals, consisting chiefly of coal; and I will deal only with the ten million tons of goods which are left as the net residue of the year's carrying. It has been proved that the preportion of non-paying to paying weight is about seven tons to one ton; and this would give seventy million tons of rolling weight employed to carry the ten million tons of paying load. In order to avoid all risk of exaggeration, I will assume the dead weight to be only as four tons to one; which reduces from seventy to forty million tons the weight of the wagons employed to carry the ten million tons of paying load. The whole gross weight hauled by the locomotives will then be fifty millions of tons, at an average speed of twenty-five miles an hour. The earnings for the goods traffic on this line are 6s. 3d. per train mile; which, at an average rate all round of 1¼d. per ton per mile, would give about fifty tons as the paying weight, and 255 tons are the gross weight hauled per train mile. Dividing this 255 tons into the fifty millions gives 196,089 trains; which, being divided by the 313 working days of a year, give 626 merchandise trains, over all parts of the Northwestern Railway, in the twenty-four hours. The company's balance-sheet shows that each net ton produces about 4s. 8d. (including minerals, but as the net amount earned per train mile in the merchandise and mineral traffic may be taken as averaging nearly the same, this does not vitiate the argument), which, at 1¼d. per ton per mile, makes the average distance traversed by each ton to be about thirty-eight miles; so that, as each ton of the total weight hauled runs thirty-eight miles, and the entire length of line worked is 1,432 miles, it follows that there must be on an average thirty-seven merchandise trains distributed over the total length. This number, divided into the total number of trains per day of twenty-four hours, gives an average of over seventeen trains per day running on each mile of the line. My object in bringing the figures to this point is to show that, although at first sight the number, 626 trains per day, looks large, yet, when divided over the entire line, it is comparatively small. Having arrived at this conclusion, we are in a position to see how it would affect the question if the gauge of the line were 3ft. instead of 4ft. 8½in. In the first place, the same or a greater speed could be maintained, say up to thirty-five or forty miles an hour. I mention the speed here because I am dealing with goods trains only. Of course when passenger trains are considered, the element of speed tells largely in favor of the broad (*i. e.*, 4ft. 8½in.) gauge; but this has been already admitted. My argument is only intended to show what a 3ft. gauge is capable of accomplishing in the way of duty, up to a speed of forty miles an hour; a speed which on such a gauge can only be obtained by the employment of the double bogie engines.

The speeds in each case being therefore equal, the next point to examine is the result of carrying on the narrow gauge. The proportion of non-paying to paying load has been taken at four to one on the broad gauge, although it has proved largely in excess of this. The wagons employed average four tons in weight, so that on this reckoning each wagon carries one ton for every mile it runs. It would be well to remember here that I am dealing with things as they are, not as they might be. The wagons for a line of 3 feet gauge weigh each one ton, and carry a maximum load of three tons. Supposing that the same number of wagons and trains were run on the narrow gauge as on the broad, it follows that the average one ton of merchandise now carried would easily be taken in a wagon weighing one ton instead of four tons, and that the gross load passing over the line for one year would be only twenty millions of tons instead of fifty millions; whilst the same amount of paying weight would be carried in either case. That is, the small wagons, which are capable of carrying three times the weight of goods now actually carried in a four-ton wagon, would only have to carry one-third of that quantity, and would produce the same paying load as the heavier wagons; thus, instead of fifty million tons passing over the line there would only be twenty millions; and, as the haulage cost is precisely the same, whether the tons hauled consist of paying or of non-paying load, it follows that this expense would be reduced to two-fifths of what it now is. We must also consider the enormous saving to the permanent way, which would have to bear the friction and weight of only twenty millions of tons in the place of fifty millions. If we assume the same number of trains to run per day, the weight of each would be reduced from 255 tons to 102 tons; or, if the same gross weight of train were employed, the number of trains per day would be reduced from 625 to 250. If there should be sufficient traffic to load the narrow-gauge wagons in such a way as to require the same number and weight of trains that are now worked, the result would be that, without increasing by one penny the cost of haulage and of the permanent way expenses, the 3 feet gauge would carry a paying load of twenty-five millions of tons, as against the ten millions now carried. Here, then, we have established the fact that, so far as capacity goes, the narrow gauge is superior to the broad one. The former can produce twenty-five millions net out of a gross tonnage of fifty millions; whilst the latter, to produce the same result, if continued to be worked as it now is, would require that one hundred and twenty-five million tons should be hauled, and that an increased cost in the same proportion of one hundred and twenty-five millions to fifty millions.

It may occur to some of my hearers to ask at this stage whether locomotives can be built to haul large train loads on a 3ft. gauge at the same speeds at which such loads are now taken on the broad gauge. My answer to this is decidedly "Yes."

The Fairlie double bogie engine cannot only be made to haul trains fully as heavy and at the same speeds as those now taken on the broad gauge, but it will do this on what is termed a light railway, with rails that shall not be required to exceed 50lb. to the yard, and that shall be fairly worn out, instead of being crushed and ground out as the 84lb. rails are under the present system. It will be seen from this that a very large and important saving could be effected on the London & Northwestern Railway, if its gauge were 3ft. instead of 4ft. 8½in., without changing in the least degree its present system of management; and that this saving, divided between the public and the shareholders, would largely reduce the tariffs to the one, whilst it as largely increased the dividends to the other.

"Before entering on another example of advantages of the narrow gauge, it will perhaps be well to explain why it is that the average paying load now carried on the Northwestern Railway bears so small a proportion to the weight of the wagons employed in carrying it. The reason is obvious enough. The railway covers a very large area of country, and penetrates into districts from which there is a very unequal traffic; so that there must be a large average of empty wagons passing from one place to another in order to accommodate this traffic. It is impossible to find the same tonnage leaving the station that enters it. There is also great competition for the traffic; since most, if not all, of the large towns touched by this railway are also supplied by one or more lines belonging to other companies, and the inhabitants, having a choice, take care to avail themselves of it by fighting one company against the other. The result is, that each company tries to outbid its neighbor, not only in rates of charge, but also in affording the greatest despatch. This practically amounts to a competition as to which company shall run the greatest number of half filled or empty wagons. Suppose, for example, that a person delivers a bundle of chairs, or a quantity of any goods, at a station, to be forwarded to some other station. The station-master cannot keep the chairs or goods until he has a wagon load going to the same place, but must despatch them forthwith, perhaps alone in a wagon that ought to carry ten times the quantity. But whatever may be the explanation of the small proportion of paying to non-paying load, the fact must in any case tell in favor of the narrow gauge. Suppose even that the wagons always ran empty one-half their time. Take the case of coal wagons, which run full only one way, and return empty. The narrow gauge still has the advantage, for they are only one ton wagons that run empty, instead of being four ton wagons. In the case of the bundle of chairs there would only be the actual weight of the chairs added to that of the one ton wagon, instead of to the weight of a four ton wagon: so that, however the matter is looked at, it will always be found that the advantages on the score of economy are enormously in favor of light narrow gauge railways. In India the competition between companies does not exist, and it is possible to detain goods at stations until a maximum quantity is obtained for transport. Time is there of little importance, and hence it has been urged that under such circumstances a large gauge and large wagons are the best, in order that it may be practicable to run a small number of heavy trains per day. It is impossible to conceive an argument more fallacious than this; and its employment has saddled India with the commencement of a system of railways extravagantly beyond the requirements of the country for the next hundred years, or even for ever.

I have just shown that a 3ft. gauge line can carry, without an additional shilling for haulage, 2⅛ times as many tons as are now carried over the 4ft. 8½in. gauge of the Northwestern Railway. Whence, then, arises the necessity for constructing the Indian railways on a 5ft. 6in. gauge? especially when it is remembered that the total goods traffic worked over the whole of them does not amount to a sixth part of that now carried on the Northwestern line alone.

Taking the case of the East India Railway as being the Northwestern of India, let us see how the absence of competition and the 5ft. 6in. gauge affect the question of transport. The number of net tons hauled over the line for the year ending 1869 was 938,629, in 32,490 trains; amounting to about 29 tons per train. The average number of wagons composing a train is taken at 25, of 5 tons each; which gives 150 tons of train to 29 tons of freight, or a proportion of over 5 tons of dead to 1 ton of paying load. It will be seen that, notwithstanding the absence of competition, and with everything to favor the working of the line, the actual dead weight is over 5 tons to 1 ton. If, on the other hand, the gauge had been 3ft. instead of 5ft. 6in., the dead weight, under the same management, would have been reduced from 5 to 1, to 1¼ to 1. Let us imagine the saving that this change would effect in fuel alone; considering that less than one-fourth of the tonnage now hauled would afford precisely the same accommodation to the traffic that now exists, and would produce the same paying result. It surely does not require a philosopher to see that the narrow gauge is infinitely superior in every respect even to the 4ft. 8½in. gauge, and it ought to be engraved on the mind of every engineer that every inch added to the width of a gauge beyond what is absolutely necessary for the traffic adds to the cost of construction, increases the proportion of dead weight, increases the cost of working, and in consequence increases the tariff sto the public, and by so much reduces the useful effect of the railway. Let us suppose for one moment that the conditions of the cost of construction in the two instances were reversed, and that a 3 foot gauge line would cost twice as much to make as a 5 foot 6 inch gauge; even in such a case the difference in the cost of working each ton of goods would be so enormous that the narrow gauge would be by far the cheapest of the two in the end. It is unnecessary to say that the cost of constructing a railway is nearly as the width of its gauge; in very rough countries the narrow gauge will be greatly less than the proportion to its width, whilst in flat, level ground the proportion will be more; but, taking the average (excluding rolling stock, fencing, stations, and telegraphs), the cost will be found to vary as the gauge. The advocates of the 5 foot 6 inch gauge, not content with the burthen which they

have imposed upon India, are striving to impose a similar burthen upon our colonies, and, in too many instances, they have actually succeeded. The colony of Victoria, for example, has been provided with a system of 5ft. 6in. gauge railways, which are so magnificent and costly that they charge the colonial revenue with a trifling deficit of £30,000 per annum. Tasmania, under the same management, has been saddled with a railway of 5ft. 3in. gauge. There are other places similarly situated but to mention them all would prolong this paper beyond its proper limits. I have shown sufficient evidence to prove what I said at the commencement; and through the medium of this great association I desire to inform the inhabitants of countries in which railways are required how these can be obtained cheaply and efficiently. In moderately temperate climates, gauges of 2ft. 6in. will be found ample for any traffic in any part of the world, and will sustain a speed of thirty miles an hour; while 3ft. is sufficient for either very hot or very cold climates, and will sustain a speed of forty miles an hour.

Railways can be made cheaply, and, at the same time, to be thoroughly efficient; and those who aver to the contrary are, in fact, enemies to progress and civilization. There is no country too poor to have railways sufficient for its requirements; and railways furnish the cheapest possible mode of transport when they are not borne down by the results of that incompetence and extravagance which we so often see associated together. I regard it as the duty of every man in the old country to assist those of the new by pointing out how they may benefit by our dear-bought experience, and may avoid the pitfalls into which only too many of our railway shareholders have fallen. The present railways in India, although doubtless valuable for military purposes, have cost about £20,000 per mile. The average rate per ton paid on the East Indian Railway is 2¼d. per ton per mile. It may be fairly questioned how far these lines are boons to the inhabitants, who are called upon to pay taxes to cover the heavy annual interest on the cost, as well as to pay the high tariff of rates mentioned above. In any Indian extensions it should clearly be our aim to satisfy the natives, and to develop traffic at their hands. How different would the results have been, even now, if the lines had cost £5,900 instead of £20,000 per mile, and if the tariff of rates had been ⅛d. per ton per mile instead of 2¼d. Not only would this have been practicable if the narrow gauge had been adopted, but the charge for the conveyance of salt, one of the first necessaries of life in the country, need not have exceeded ¼d. per ton per mile.

I cannot close this paper without some reference to a matter that is now part of history, and that serves as an admirable illustration of the manner in which self-interest, or even mere conservatism, may render men blind to the most obvious propositions. There are some whose whole desire it seems to be to rest in the paths that they have become accustomed to tread, and whose instincts lead them at once to turn and rend anyone that proposes a change. In January last my presence was hurriedly required in St. Petersburg by the Russian Minister of Public Works, with reference to the Fairlie system of railways, to which attention had been called by the very able articles upon the "Railway Problem," which appeared in the *Times* on the 19th, 20th and 21st October, 1869. His Excellency the Minister required me to give a short distinct account of the advantages claimed for my system. I replied that by the adoption of that system railways could be made at a cost of a little over one half the sum required to construct them on the ordinary plan; so that it would be possible to give nearly two miles for the sum now expended upon one. That these lines, when finished and equipped, would possess a carrying capacity equal to, if not greater than, that of those on the old system. In other words, they should be capable of carrying as many passengers and tons of goods in twenty-four hours as the best lines now existing; and that this should be done at a reduced cost, independently of the reduced wear and tear of the permanent way, and of the value of the increased life of the rails. His Excellency observed that if only a portion of this could be accomplished it would be a great thing for Russia, and that the matter should be at once inquired into. Not many days elapsed before an Imperial Commission, composed of a number of the most noted scientific men in Russia, and presided over by his Excellency the Count Alexis Bobrisky, private attache to his Imperial Majesty the Emperor, was instructed to come to this country and to investigate the correctness of what I had asserted. Early in February the commission arrived in London, and after a thorough examination of the question in all its theoretical bearings, it was resolved to put it to some practical tests. The Council of India, the Board of Trade, Norway, France, and other countries sent their representative men to be present on the occasion, as it was felt that what was good for Russia would be equally good for the countries I have mentioned. His Grace the Duke of Sutherland, always anxious to promote any system that will most largely benefit mankind, and having already a large section of railways of his own, built expressly to improve the condition of his tenantry, joined the party, and took a most active interest in all the proceedings. The results of the experiments then made are pretty well known, and any who may not be acquainted with them will find printed records of them on the table. The commission returned to Russia, and sent in its report to the effect that I had fully proved the correctness of all my assertions. This was in March; and in April a railway of fifty versts, on the new system, was ordered by his Majesty the Emperor to be constructed, and to be opened in November next. The locomotives for this railway may be seen any day during the next month at the establishment of Messrs. Sharp, Stewart & Co., Manchester. The new system has also been adopted for working some of the old lines, and the stock for the Tamboff-Saratoff Railway, the great Russian. and others, may be seen under construction at the same establishment.

The members of the Council of India were so struck with the accounts of the system that the home engineers of the several Indian railways were requested to report to their respective boards their opinions on the applicability of a new narrow gauge for India. I have seen several of these reports, the whole of which are unanimous in their opposition to any improvement, or to any interference with the system under which the writers have lived, and moved, and had their being; but in only one of them is there argument that requires a moment's notice. Mr. Hawkshaw, in his Report to the Directors of the Eastern Bengal Railway urges that, since those who are in favor of a narrow gauge argue upon the b sis of a light rolling stock, the same basis should also be taken by the advocates of a broad gauge. Were it not for this attempt at reasoning, and also for the fact that Mr. Bidder very fiercely attacks both me and my system, I should have left the reports wholly without mention. But I think it is worth while to reply to Mr. Hawkshaw, and also to place on record that Mr. Bidder has evidently never seen my system, although often invited to do so, and that he has based his condemnation of it upon an utterly incorrect description, both as regards principles and details. The claim to calculate for broad gauge lines on the basis of a lighter rolling stock is practically an admission that grave errors have been made in designing that which is now in use, and which it is proposed theoretically to set aside while the question of gauge is under discussion. But however Mr. Hawkshaw may build his stock in the future, he cannot possibly build it so light and capable of doing so much duty for the broad as for the narrow gauge. His argument is a complete confession of the mistakes made under the old regime; whilst at the same time it is an attempt to extinguish the general wish to inquire into the merits of the new. It is asking to be forgiven for the past, with a promise to do better in the future—or to do anything rather than permit clients to go to a new school. It is a sad incident in the great history of human error when we thus find men led into such mistakes as these by their anxiety to resist innovation. How different would be the course of invention, how smooth the path of improvement, what years of anxious labor would be saved to many of us, if such men would lay aside all rivalries, and would bring their helping hands to the good work of progress."

## Color-Blindness in Railroad Employes.

To Dalton and Herschel belong the credit of first directing attention to persons suffering from color-blindness, who may even themselves be in happy ignorance of the fact, because of this peculiar condition of vision not necessarily defecting the eye or interfering with the ordinary requirements of sight. We understand that those practitioners who examine men for employment upon railways and who take the trouble of testing whether the person before them suffers from color-blindness or not, discover it no unusual fact to find them erroneous in recognizing certain color rays, and that the shades wherein most err are red, yellow, green, and blue—the red being mistaken for yellow by some, the yellow for green, the pale green for cloudy white, and the blue for black, the very shades which all persons working upon or connected with railways, or holding situations wherein co ored lights are employed, as in vessels at sea or light-houses, should be perfect in, as a mistake might prove disastrous to many. Indeed, very few persons are perfect in their color vision. Dr. Wilson, who is an authority on the subject, states that one person in every eighteen is color-blind in some marked degree, and that one in every fifty-five confounds red with green. Any one of this fifty-five must needs be a dangerous person if entrusted with the working of colored signals; accordingly it behooves railway companies to test periodically, through their medical officer, the condition of vision in detecting colors of their operatives, for if color-bindness exists we know education of the eye or treatment will not improve it. We know a gentleman who always recognized light red as violet, and when lightning existed in the atmosphere the flash always assumed a violet hue to him. Men, then, who pace the deck of a steamer on watch, signal-workers, and railway guards should be even above suspicion of being color-blind for an obvious reason, and to avoid danger their efficiency should be properly tested.—*Medical Press and Circular.*

## Submarine Cables.

In these days, despite the mail facilities which all enjoy, the demand for a speedier method of transmitting intelligence has become universal—a demand which fortunately the genius of the age is able to supply. The telegraph has become, therefore, an important and essential feature in all land and climes. While but a short time ago it was a costly means of transmitting information, and restricted in its operations to comparatively narrow limits, to-day it girdles the world, and telegraph poles and wires are scattered all over the land. With an increase of its facilities prices have come down to a somewhat reasonable figure, and both the poor and the rich are now enabled to speak with the voice of Jove if they wish to. Every branch of industry has profited by these increased facilities, and no one can accurately estimate the advantages bestowed on men by the discovery and extensive use of the electric telegraph. Armies move at the click of the operator's hammer, and friends converse across oceans as though they were in the same room. At first land wires were the rule, and not until 1851 was the idea of a submarine cable carried into practical execution. Since then the obvious wants of commerce have demanded a greater extent of submarine cables throughout the world. There are already 22,000 miles in active operation, with 27,000 miles of wire. There are 20,828 miles of cable further proposed and under contract, For the former, a capital of about $40,000,000 has been expended; for the latter an additional capital is demanded of $45,000,000. A late number of the *Bankers' Magazine*, to which we are indebted for most of the facts in this article, says, the success of submarine lines being once demonstrated, the demands of commerce for extended systems of submarine telegraphs, are beyond anticipation. As this question is now occupying attention, and much exaggeration and misapprehension exists, it will be instructive to analyse the subject in its present condition, and the more so as English and foreign capital combined is about to complete a circumterrestrial telegraphic communication.

Firstly, the commercial view of the question: Can the existing tariff be so reduced that the benefits of the system will be much more extended than at present? And will this reduced tariff be remunerative? An average commercial message is calculated to be composed of thirty words. Skillful operators can attain a working speed of sixteen words per minute. Of course, upon extended lines differences of longitude render active operations throughout the day feasible, this continuous work being carried on by relays of electricians. But the intervals of transmission and receipt, etc., of messages being considered, the working day is practically reduced to twenty hours. In this period 600 messages can be transmitted. These, charged at the Atlantic Cable tariff, would show a return of $18,000; and allowing three hundred working days to the year, one Transatlantic conductor, for example, would yield an annual profit of $5,400,000. We leave the deduction to be formed from the above answer to the two questions recorded in the foregoing paragraph. Such facts should be words of confidence to the community where practice has proved the practicability of laying submarine cables. In an interesting table of submarine cables for 1870, we find the following statistics:

| | |
|---|---|
| Number of cables laid | 64 |
| Length of cables, in statute miles | 22,007 |
| Miles of insulated wire | 27,402 |
| First cable laid in 1851—Dover to Calais | 27 miles |
| Last cable laid in 1870—Aden to Suez | 1,419 miles |
| Longest cable—Brest to St. Pierre | 3,014 miles |
| Shortest cable—across mouths of Danube | 3 miles |
| Cable with most conductors—Denmark to Great Belt, 9 conductors. | |
| Cables with fewest conductors—38 with one conductor. | |

LIST OF CABLES UNDER CONTRACT TO BE LAID.

| Name of Company. | Place from and to which Cables are to be laid. | Length of Cable in statute miles. | When to be completed. |
|---|---|---|---|
| Falmouth, Gibraltar and Malta | Porthcurno, near Penzance, to Gibraltar | 1,669 | |
| | Gibraltar to Malta | 1,195 | May, 1870. |
| Cuba Submarine | Santiago de Cuba Batabana, Cuba | 639 | May, 1870. |
| Jersey & Guernsey | England to Jersey and Guernsey | 116 | May, 1870. |
| Great Northern China and Japan Extension Co. | Posietta to Shanghai | 1,400 | |
| | And Shanghai to Hong Kong | 1,283 | July, 1870. |
| West India and Panama | Cuba through W. India Islands to Surinam, with a branch to Panama | 2,975 | July, 1870. |
| Marseilles, Algiers and Malta | Marseilles, Algiers and Malta | 1,006 | Aug. 1870. |
| Panama and South Pacific | Panama to Tumbez, in Peru | 1,283 | 1870. |
| British Indian Extension | Galle to Singapore via Penang and Malacca | 2,049 | 1870. |
| China Submarine | From a Station in the Straits of Malacca, of the British Indian Extension line to Hong Kong | 1,913 | |
| | And Hong Kong to Shanghai | 1,166 | June, 1871. |
| Calcutta and Singapore | Calcutta to Singapore, via Penang and Malacca | 2,129 | 1871. |
| British Australia | Singapore to Batavia | 657 | |
| | South Eastern extremity of Java to Port Darwin. | 1,357 | 1871. |
| | Total miles | 20,828 | |

*N. Y. Times.*

## Liability for Fires from Locomotive Sparks.

The following were the instructions of the Superior Court of Chicago in the case of Christian Weldt, *vs.* the Pittsburgh, Cincinnati & St. Louis Railway Company, where suit was brought to recover the value of hay alleged to have been burned upon plaintiff's farm, by emission of sparks from a locomotive, negligently allowed. The Court instructed that if the hay was the property of plaintiff, and that it was destroyed by fire communicated from defendant's locomotive, which was upon its right of way, there being no negligence on the part of plaintiff, then negligence is chargeable upon defendant, unless defendant affirmatively prove that it used, as far as possible, all means to prvent the injury; wherefore if defendant permitted weeds and grass, after being cut, to lie along its right of way, which communicated fire, which destroyed the property, then there is a liability. The corporation is, moreover, bound by law to use all mechanical appliances used by like organizations to prevent the spread of fire from its locomotives, and, in default, it may be liable for damages resulting. But a railroad company has a right to use fire for the purpose of generating steam, and is not liable for injuries unavoidably produced by keeping up such fire, if, however, proper care is exercised in the construction of the machine and in the use of the fire. So, if the particular engine had the most approved appliances, was in good repair, and was properly used, and if otherwise due diligence was used to prevent injury, then there could be no recovery.

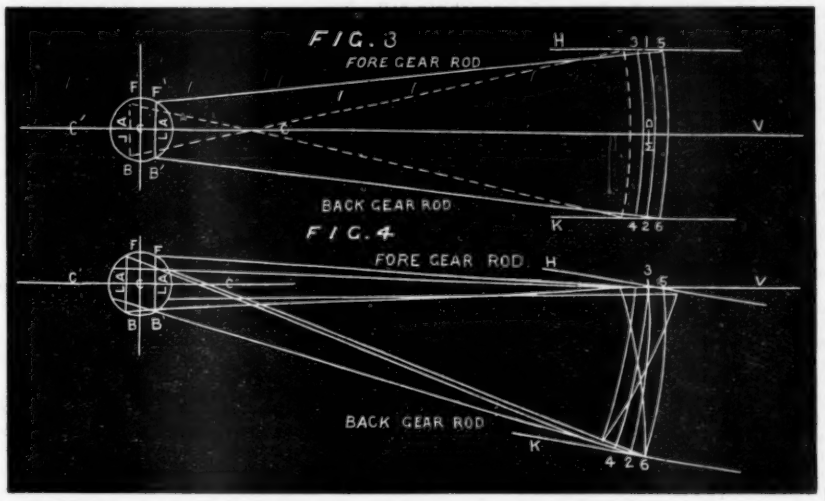
—The town of Carthage, Missouri, voted last week adversely on the proposition to aid the Tebo & Neosho road. The Carthage *Banner* says many boys and girls of tender years voted, and severely rebukes the practice by saying, "this, when discovered, was discountenanced by many of our best citizens."

## ON LINK MOTION.

BY JAMES BASKERVILLE.

[Concluded from Vol. 1, page 604.]

In designing a link motion the first things to be considered are the proportions of the slide-valve, and they of course are determined by the capacity of the cylinder and the speed of the piston. Suppose it is determined for a given engine to have a valve with ⅞in. of lap, and 4½in. of travel, and ⅛in. of lead in full throw, the next things to be determined are the lengths of the eccentric rods and the length of the link. Say that space limits us to a 3ft. rod, and as there is no law for the length of the link any more than the eccentric rod, we will set it down at 12in. from centre to centre of eccentric rod pins. The "lines" of this motion should then be laid down on the drawing-board in the two positions shown in Fig. 3. Draw the main centre line *C V* as that which passes through the centres of the crank shaft and valve spindle; let *C* be the centre of the crank shaft, and round it draw a circle 4½in. diameter for the path of the centres of the eccentrics, which is equal to their throw; take diametrically opposite points *F* and *B*, at right angles to the line *C V*, as the temporary positions of the centres of the forward and backward eccentrics; draw two lines *H* and *K* parallel to the main centre line and at equal distances from it, and let them be the length of the link (12in.) asunder. Then take 3ft.—the length of the eccentric rod—in the trammel; set one leg in centre *F*, and mark with 1 the point of intersection of the other leg with line *H*, and with 4 its intersection with line *K*. Then set the trammel in centre *B*, and mark with 2 the intersection of the other leg with line *K*, and with 3 its intersection with line *H*. Again set one leg of the trammel in point of intersection 1, and the other leg wherever it comes on main centre line *C V*, and draw the arc 1, 2; do the same with point of intersection 3, and draw arc 3, 4. These two arcs are the true curvation of the link, and their distance asunder is the amount of motion caused by the crossing of the rods: in the present case it is ¾in., or ⅜in. on each side of the point *M D*, which is the *mean distance* of the centre of the link from the centre of the crank shaft, and the centre of the link will be at *M D* when the valve is at the middle of its stroke, covering the ports seven-eighths of an inch on each end. For distinction sake let us call these two positions of the link *the positions of no lineal advance.*

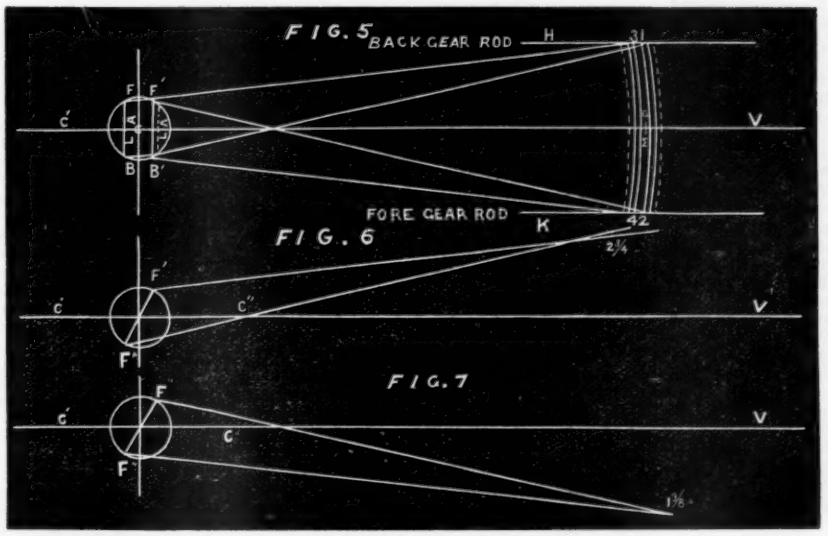



The valve has seven-eighths of an inch of lap, and one-eighth lead, giving 1in. for the lineal advance of the eccentrics. Draw Line *L A* 1in. from centre *C* and parallel to *F B*, and where *L A* intersects the circle at *F'* and *B'* there are the proper positions for the centres of the eccentrics. Once more take the trammel—still set at 3ft.—and place one leg in *F'*, and mark point 5 where the other leg cuts line *H*; do the same with point *B'* and mark point 5 on line *K*; draw the arc 5, 6 as before directed, and there we have the position of the link when the crank is on the back centre at *C'*. The dotted lines show the positions of the gearing when the crank has made half a revolution and arrived at the front centre at *C'* and the rods have crossed.

It will be seen that there is a distance of 2¾in. between these last positions of the link, although the lineal advance would in itself account for only 2in. distance, but to that we have to add the ¾in. of motion caused by the crossing of the rods, making altogether 2¾in., or 1⅜in. on each side of the "mean distance point." But the valve covers the port only ⅞in., and therefore, when it is moved 1⅜in. from that position by the link it must leave the port ½in. open, or in other words there is ½in. of lead with this valve motion when the link is in "middle gear," and only ⅛in. when in "full throw" with the end of the link opposite the valve-spindle.

In this position Fig. 4, the forward gear eccentric rod is exactly opposite valve spindle, which therefore derives its motion exclusively from this rod for the time being. The apparatus now assumes the simple character of a valve driven by a *common single eccentric and one rod.* The effect of the crossing of the rods has entirely disappeared from this end, but it remains unaltered at the centre of the link, and is doubled at the other end. This is plainly shown by the "positions of no lineal advance" 1, 2, 3, 4, which are coincident at the forward gear end, ¾in. asunder at the middle, and 1½in. asunder at the back gear end of the link. But that does not increase the total motion at that end, which is ever and always equal to the throw of the eccentric, and the valve has the exact amount of lead (⅛in.) due to its lap and the lineal advance; but from that position the lead gradually increases as we approach the centre, when the maximum of ½in. is attained, for there the whole effect of the crossing of the rods is felt. Of course the same observations apply to the other half of the link when the rod which actuates it is placed opposite the valve spindle.

Hitherto I have spoken only of that arrangement of link motion in which the lead is *greater* in "middle gear" than in "full throw." I shall now glance at that arrangement which produces a contrary effect on the lead, making it *less* in "middle gear." This is illustrated in Fig. 5. In this figure all dimensions and letters are the same as in Figs. 3 and 4, the only difference being in the disposition of the rods, which is contrary to that of 3 and 4, for in this the back gear rod is attached to the upper end of the link and fore gear rod to the lower end. The vibration at the *ends* of the link is still of course equal to the throw of the eccentric, and the amount of motion transmitted to the valve *in full throw* the same as in Figs. 3 and 4; but the motion at the centre of the link is considerably reduced, for it is now only 1⅜in. or 11-16ths on each side of the "mean distance point;" but the valve has ⅞in. of lap, and would require to move that much on each side of its middle position before it would begin to uncover the port at all; but the link can only move 11-16ths on each side of the "mean distance point," therefore in this arrangement of the motion, when the valve has ⅛in. of lead at the end of the link or in "full throw," *it is actually 3 16th blind at the centre*, or in "middle gear," and in order to get ⅛th of lead in that position, we must cause the centre of the link to vibrate 2in., and to do that the "lineal advance" of the eccentrics must be increased from 1in. as at present to about 1 5-16in. shown in dot lines, and then the lead of the valve when in full throw will be about 7-16in.




Now what is the reason of all this? Why is it that in Figs. 3 and 4 the vibration of the link at the centre is so much greater than it is in Fig. 5, the lineal advance and every other dimension remaining equal? The crossing of the rods produces a similar effect in both cases, viz., ¾in., as is shown by the "positions of no lineal advance" 1, 2, 3, 4, and does not account for any of the difference, and we must therefore seek it elsewhere, and that too without going into the geometry or trigonometry of the case, for which I know the majority of your practical readers have no relish (neither have I).

Fig. 6, is just a portion of Fig. 3, extracted and laid down separately for sake of greater distinctness. *C'* and *C''* show the crank on the two dead centres; *F'* and *F''* are the corresponding positions of the centre of the forward gear eccentric, the rod of which is carried to the, *upper end of the link;* and between these two positions of the end of the eccentric rod there is a space of 2¾in.

Now look at Fig. 7. It is a portion of Fig. 5, showing the forward gear rod attached to the *lower end of the link* In this case there is a space of only 1⅜in. between the two positions of the end of the rod, and as the back gear rods in both of these cases perform the same as the forward gear rods, there is no necessity to show them or the links, and the figures are plainer without them.

The alteration of the lead of the valve is a grave defect of the link motion,—the *shifting link* motion, I mean, such as we have been considering hitherto; but the *stationary link* is free from that defect. The "shifting link" is so called because in the act of reversing the engine or altering the grade of expansion, the link is moved up or down by the reversing lever or wheel, as the case may be; but the "stationary link," as its name implies, is a fixture, and is suspended or sustained from some fixed point, and has no motion except that imparted by the eccentrics. The reversing lever has no connection with this link, but the engine is reversed or expansion altered by means of a rod called the "valve spindle connecting rod" one end of which is jointed to the head of the valve spindle, and the other end carries the slide block, which fits in the slot of the link. The reversing lever is connected with this "valve spindle connecting rod" by any suitable means, so that the attendant can place the slide block to work in any part of the link, either for reversing or expansive working.

The "stationary link," as regards its curvature, is placed the reverse way to the "shifting link," for it is set with its concave side towards the valve spindle, and the radius of its curvature is the length of the "valve spindle connecting rod," but in the shifting link motion the radius of the link is the length of the eccentric rod.

The stationary link motion is a much more elegant and scientific piece of work than the shifting link, and it possesses the great advantage of preserving the lead unaltered in all positions; but it has not come into general use, owing to the great length required for its proper development—a length altogether out of the question in screw boat engines or locomotives.

### New Harlem Bridge.

Among the various improvements which have recently been undertaken by Commodore Vanderbilt, is the construction of a new iron bridge over the Harlem River in the place of the wooden structure now used. This information, it is believed, will afford very general satisfaction to the thousands of passengers who daily visit the city. Four piers of solid masonry 40 by 14 feet' have already been erected for the support of two stationary spans of the bridge, each 161 feet long. The work upon these will be immediately commenced and pushed with vigor. The centre pier upon which the draw will rest and turn will be octagon in form, 33 feet across its face. This will also be built in the most substantial manner of solid masonry. The iron draw or swing span will be 200 feet long, so as to leave a clear opening on each side of 85 feet for the passage of vessels. In opening and closing of the draw steam power will be used, as the most reliable and effective for the purpose. It is believed that the piers of the new bridge will last for years, although the cost of their construction has not exceeded $80,000, while those of the new iron bridge at the head of Third Avenue, being iron columns filled with concrete and considered less durable than stone, cost the city about $500,000.—*New York Tribune, Oct. 7.*

### A Chapter on Railroad Signals.

To at least two-thirds of the general traveling public the diabolical yells of the steam whistle on the engine, the mysterious waving of flags and the pantomimic gestures of the hands by those employed on trains are but as a sealed book. As a knowledge of these signals may sometimes avert or at least mitigate accidents, it may be well to explain some of them to the uninitiated.

Upon nearly all roads in this country the numbers of sounds of the steam whistle represent the same orders or warnings; but on the Erie Railway in one or two instances the rule is exactly reversed. Thus upon that road one clear and sharp whistle means danger, and repeated quickly signifies that the danger is imminent, while upon other roads it is simply a note of go ahead or of warning when approaching a crossing or station. Those accustomed to traveling upon the Erie road, and who understand the whistles as there used, frequently, therefore, make ludicrous mistakes when upon other lines. Others, however, when upon the Erie are in constant dread of their lives, hearing often the two quick whistles, which upon their own line means danger, but which, as there heard, mean all right.

Premising, therefore, that these whistles, namely, one and two notes, are reversed upon the Erie, we will proceed. One whistle may be in most cases set down as the signal for going ahead, releasing the brakes by the brakemen, and of warning when approaching a depot or crossing. Two sharp and decisive whistles mean danger, and when repeated in pairs, signify that the same is close at hand. The passenger should then avoid, above everything, the evil habit of sticking his head out of the window of his car, dangerous at any time. but doubly so then. Three whistles are the signal that the train is about to back or retrace its steps, but are seldom heard by ordinary passengers, the signal being more often used in drilling trains in the yards.

Whenever stoppage of a train takes place upon the track a watchman is at once sent to the rear with flag or lantern to notify and stop following trains. It is to recall him to his train that the next signal of four long whistles is used. An engine nearing certain stations will sometimes herald its approach with a number of sharp quick whistles, which have the effect of setting a dozen man around that station running to a given point. The call is for wood, and, like the supposed use of a word by some birds, may be said to be exactly as if the engine said "Wood, wood, wood," and repeated it *ad infinitum*. Certain roads and the engineers thereof arrange codes of whistles to suit themselves, differing in the number of sounds and the time between them, all of which are, as a general rule, of little interest to anybody but themselves, and refer principally to greetings, etc., and may rightly be designated as the gossip of the road.

Flags in this country are of three colors, red, white and green, and refer to danger, safety and precaution. It is a much-debated question as to what color is best adapted for a distant railroad signal, but all authorities agree upon the fact that red is less easily distinguishable than many other colors. Violet is said to be the color that can be seen at the greatest distance, and the one which does not blend itself into the colors of the general landscape, foliage of trees, &c. Red, however, is the old stand by, and preserves its post, as a signal of extreme danger. No train may pass a red flag, no matter in whose hands it may be, and the smallest child has the power to stop an express train; but of course not the power to prevent getting into trouble for the same afterwards. A red lantern at night serves a similar purpose, but as occasionally the light and bearer may not be noticed by a careless engineer, the flagman has the privilege of throwing his lantern at the glass windows of the cab of the engine, which will necessarily call attention to the fact of something being wrong. Torpedoes, small affairs which are fastened by wires to the track, but which when passed over by the engine explode with a wonderful amount of noise, are furnished all brakemen by the railroad authorities, and are freely used at night. The white flag is all over the world a symbol of peace and secu ity, and is used upon railroads to signify that trains may proceed in safety. The green flag is on many roads used as a signal of precaution to trains to run slowly when passing over unsafe pieces of track, or when possible danger may result from the usual high rate of speed.

Upon other roads, however, the same signal is given by waving both a red and a white flag together. The green flag attains a celebrity at least one day in a month, which is not accorded to that of any other color. If an engine is seen carrying green flags, the signal is understood by all employed on the railroad that the paymaster of the road will come by the next day to distribute his funds.

Passengers upon trains may often have seen engineers and others employed on the road saluting each other by motions of the hand and displays of certain figures. While there is no regular rule for these signals, they have become generally so understood and used that they they are in use everywhere. The open hand signifies "all right," and is a salutatory sign. The displaying of of one, two, three or four fingers means the number of trains that are following, and is an aaswer to the question as to any query of the kind which is asked by a railroad man upon the track, or by a passing engineer, and which is expressed by first closing the hand and then opening it. The answer is given by closing the fist if no trains are following, and giving their number upon the fingers if any are behind. To ask the question "How near is the next following train?" which may be asked by the engineer or conductor or the telegraph agent, or by a track master or other official, of the engineer, the hands spread open are placed nearly together and then the arms are thrown back. The answer as to whether they are close behind or still some way back is given by describing an imaginary distance with the open hands, the nearness which they are together signifying the closeness of the trains.

In these days of electric switches, semaphores, and patent signals of every description, it would seem as if collisions, accidents from neglected switches or open bridges would, or should, be impossible. Yet such accidents do occur every day, and railroad superintendents search in vain for sure and certain methods to avert them. The electric switch would seem to be a most excellent preventive against a neglected switch, yet railroad companies do not, as a general thing, use them at any but the most important points, such as entrances to large stations, when arriving at bridges, etc.

The alarms given by these switches are entirely beyond the control of every person, so that meddling with them for an evil purpose is impossible. Wherever they are placed is also erected a small tower, upon the top of which are windows. The tower is connected, no matter whether the distance is one or a thousand yards, with the switch by means of an underground wire, and contains a bell, a galvanic battery, and a red flag. Upon the severance of the connection with the battery by the opening of the switch the flag appears in the windows, and the bell sets up a most dreadful clatter. At night a light in the tower is seen through the red flag, which is the danger signal with the bell. The expense of these batteries and their towers and connecting wires is their only drawback.

An old preventive against running through an open drawbridge is yet in use on some roads, and consists of a gallows-like erection, raised over the track several hundred yards from the bridge, and from which is suspended a large and heavy board, which swings like the old-fashioned signboard of an inn. A wire rope connects the board with the bridge, and upon the drawbridge being opened the board is lowered till it swings about on a level with the bottom of the smoke-stack of a locomotive. Should an engineer not see that the lights or flags of the bridge are set for danger and dash onward, the board will immediately arouse him to a sense of his peril by clattering over the smoke-stack, steam-whistle and cab of his engine, and, perhaps, carry away one, if not all, of those useful appendages to his locomotive. The remedy is a forcible one, but is one that has at least the merit of being effective.

Some ingenious and enterprising enthusiast has, however, invented a plan which he claims insures entire safety from collisions, and which, it is to be hoped, may be found practicable, and adopted by roads generally. He proposes to fix batteries at places along the line, and distant about a mile apart, each being coupled with a tower, light and bells. Wires are to run the entire length of the line, and so long as the pressure of a train is upon each mile of track the bell, flag or light of that mile will so proclaim it.—*New York Evening Post.*

### Complicated Railroad Litigation.

A suit involving millions of dollars and many intricate points of law is now pending in the Clark county (Indiana) Court of Common Pleas.

The facts in the case are alleged to be as follows: The Fort Wayne & Southern Railroad Company was chartered in 1849, with terminal points at Fort Wayne and Jeffersonville, Indiana. The company owned valuable real estate, upon which it depended for the construction of the road. The roadbed was mortgaged for $2,500,000 before it was completed. The real estate bonds went up, as did the road. A few miles of grades, cuts and fills were made, and there the work ceased. The real estate got into the hands of different parties, a Mr. John C. Parker being largely interested in it, and, it is said, he manipulated matters pretty much to suit himself, but failed to make a success of the road or to enrich himself.

Finally an Englishman named Wagstaff came to Parker's relief. They organized a new company, called the "Indiana Southern Railway Company," Wagstaff subscribing $10,000,000 and a few friends a few hundred dollars each, so as to form a directory. Parker was to place the road in Wagstaff's hands, and Wagstaff was to pay Parker two or three million dollars. The latter brought suit in the Clark county Court of Common Pleas in the name of J. B. Merriweather and others, who he said were stockholders. Judgment by consent was entered for the sale of the road and its franchises. The sale took place and Wagstaff became the purchaser of the road, and the sheriff's deed for it was given. A mortgage was then given and bonds issued to the amount of $10,000,000. Wagstaff shortly afterward disappeared with the bonds, and Parker was left without any portion of his two or three millions. The bonds have not yet turned up.

Parker then concluded to wipe out old scores and begin anew. The judgment of the court was reversed, and another was entered in his favor for an amount something less than $1,000,000. He then procured some of the old bonds of the Fort Wayne & Southern Railroad Company and undertook to sell the road-bed to the Ohio & Mississippi Railroad Company at one end and to the Fort Wayne, Muncie & Cincinnati Railroad Company at the other, leaving a middle portion unsold.

The judgment of the court upon which the rule had been made to Wagstaff was "expunged from the record as a fraud upon the court." The sale was then made to the Ohio & Mississippi Railroad, and Parker received about $1,000,000. The Ohio & Mississippi Railroad Company built a road upon the bed from North Vernon to Jeffersonville at an expenditure of two millions. The Fort Wayne, Muncie & Cincinnati Railroad Company built a road from Muncie to Fort Wayne at a cost of $1,00 ,00 . Then the London, Liverpool & Globe Insurance Company, of London, raked up a suit in the Clark County Common Pleas Court, which had been commenced some three years ago. They moved to set aside the expunging order formerly made by the judge. Be ore this motion was made, however, the plaintiffs had asked a change of venue, which was granted by the court; but, upon further deliberation, they concluded to let the trial go on in the Clark County Common Pleas Court. So the case was reinstated. The motion to set aside the expunging order was granted, and the fraudulent order was restored.

Then Wagstaff's bondholders brought in a cross petition, praying that the road, including the new road constructed by the Ohio & Mississippi Railroad Company and the Fort Wayne, Muncie & Cincinnati Railway Company, be sold to pay the $10,000,000 named in Wagstaff's bonds. It seems that Parker was working in the interest of his old friend Wagstaff, having obtained a share of his bonds, and was working against the companies who had expended three millions after paying him his price upon the faith of his representations that he had a good title to the road.

On motion of the plaintiffs, the Ohio & Mississippi Railway Company, and the Fort Wayne, Muncie & Cincinnati Railroad Company were dismissed out of court in spite of their objections, leaving the Fort Wayne & Southern Railroad Company and the Wagstaff Company the only defendants in the case. The attorneys of the Fort Wayne & Southern Railroad Company were now in the way of the further progress of the case; so the power of these attorneys was revoked by order of Mr. Fogg, President of the concern, and another attorney was appointed. Then the Fort Wayne, Muncie & Cincinnati and the Ohio & Mississippi companies filed petitions praying to be made parties. The directory of the Fort Wayne & Southern Railroad repudiated President Fogg's order revoking their attorney's power, and presented the paper to the court, but it was not allowed to be filed.

The Wagstaff party made a motion to appoint a receiver to take charge of the two roads and run them in the interest of Wagstaff. This would probably have been granted, but the court and parties to the suit could not agree upon the person to be appointed receiver.

At this stage of the proceedings the court adjourned till November 14, taking time to consider.—*Louisville Courier-Journal.*

### The Inspection of Boilers.

As from time to time we receive the reports of the various boiler inspection and assurance companies, the necessity for some compulsory examination recurs with renewed force. From the report of Mr. Marten, the Chief Engineer of the Midland Steam Boiler Inspection and Assurance Company, we find that records have been obtained of thirty-seven explosions this year. Of these, no fewer than thirteen were due to "culpable negligence," whilst seven and fourteen were respectively due to faults of construction and faults of working. Considering the facilities we now have for testing the strength of boilers and their capabilities for doing the work required of them, this state of things must be considered deplorable. When a boiler explodes after due inspection, there is some reason or excuse in saying that it was an accident; but when an explosion takes place with a boiler that has never been examined, and probably received but careless attention, surely a verdict of manslaughter should be returned in the event of any one being killed. The majority of the steam users in their evidence before the Parliamentary Committee, whose sittings are adjourned till next session, were of opinion that inspection should be made compulsory by an act of parliament; but they were unanimous in refusing a government examination. It was urged that all boilers should be registered and receive a certificate that they are in working order, which would be of assistance in case of accident, but should certainly not relieve the owner of his responsibility. The hydraulic test is cheap, easy, and efficient, and if this, or some test equally reliable, is not adopted, no matter what may be the actual cause of explosion, surely an "accident" must be considered the result of culpable negligence.

A boiler can be inspected at so moderate a rate that any neglect of this precaution should be punished, in the event of an explosion, with severe measures. We are not of opinion that government interference is desirable; but if users of steam persist in neglecting ordinary precautions we see no alternative but to make the periodical inspection of boilers compulsory, and to hold the employer responsible for damages to life or limb. All the government interference that is necessary consists in permitting no boiler to be worked that is not certified as being in good order by a properly qualified officer of one of the associations now in existence or to be formed. This, together with holding the user responsible for any damage that may result from an explosion, both civilly and criminally, will do much to alleviate the distressing consequences of an incautious and careless use of steam. That 16 persons should be killed and 27 injured in eight months by explosions due solely to carelessness, is a state of things that calls for immediate and effectual action. The committee appointed to inquire into this subject by the British Association have presented their report to the Mechanical Science Section.—*English Mechanic.*

—Mr. Charles B. Vignolles, Chairman of the Mechanical Section of the British Association, at the recent Liverpool meeting, in his opening address, said: "I think I "shall be disabusing the minds of many who have sup- "posed this country is not prepared, or that the govern- "ment have been unaware of the necessity of creating "the best means of communication in the event of inva- "sion or war, by stating that for several years the mili- "tary department at the Horse Guards and the chief "engineers of the country have been in constant com- "munication, and have formed deliberate arrangements "by which, in the event of any casualty occurring, such "as the invasion of the country, within forty-eight "hours the whole of the military forces of the country "—100,000 men—if we had them at our disposal, might "be in forty-eight hours brought to any one point of assault." Mr. Vignolles next pointed out by extracts from Kinglake's "Crimean War" that in fine weather, without opposition, and under the guns of the fleet, it took five days to land 26,000 troops, 1,000 horses, and 60 guns. These facts, Mr. Vignolles said, would, he hoped, be some consolation to the old soldiers and old women as to our alleged "want of preparation."

# General Railroad News.

## TRAFFIC AND EARNINGS.

—The earnings of the Albany & Susquehanna Railroad for the last four months have been as follows:

| | 1869. | 1870. | Increase. |
|---|---|---|---|
| May | $65,501 90 | $79,155 35 | $13,653 45 |
| June | 63,886 65 | 86,822 04 | 22,935 39 |
| July | 64,812 73 | 92,253 76 | 27,541 03 |
| August | 59,777 90 | 105,824 92 | 46,047 02 |
| Total | $253,979 18 | $364,156 07 | $110,176 89 |

—The aggregate receipts of all the Italian lines to July 31 this year amounted to £2,045,401, as compared with £1,989,011 in the corresponding period of 1869, showing an increase of £56,390. The aggregate extent of line in operation at the close of July was 3,652½ miles, as compared with 3,431⅞ miles at the close of July, 1869. These returns include the South Austrian and Upper Italy, the Roman, the South Italian, the Calabro-Sicilian, the Turin & Cirie, and the Mont Cenis. The extent of line worked at the close of July upon the South Austrian and Upper Italy was 1,753⅛ miles; upon the Roman, 736¼ miles; upon the South Italian, 816⅞ miles; and upon the Calabro-Sicilian, 316¼ miles.

—The following are the stock shipments of the Kansas Pacific Railway for the month of September: Number of car loads, 1,005; number of head, 19,868. Total number of car loads from January 1 to October 1, 1870, 38,188. Total number of head from January 1 to October 1, 1870, 75,608. The estimated earnings for the same month are as follows: Month of September, 1870, $306,987.48; month of September, 1869, $236,650.25.

—The traffic receipts of the Grand Trunk of Canada for the week ending September 17 amounted to £33,700, against £32,100 in the corresponding week of last year, showing an increase of £1,600.

—The traffic receipts of the Great Western of Canada for the week ending September 16 amounted to £18,722, against £16,570 in the corresponding week of last year, showing an increase of £2,152.

—The report of the Directors of the Dexter & Newport Railroad speaks well for the new road, and shows that $18,000 have been received on the lease to the Maine Central Railroad, and that $10,500 have been paid on interest on town scrip, leaving $7,500 to be divided among the holders of $121,700 of stock, or about six per cent.

—Mr. S. T. Smith, Auditor of the Kansas Pacific Railway Company, reports the following estimated earnings for the month of September:

From freight:

| | | |
|---|---|---|
| Ordinary | $191,840 00 | |
| Government | 5,090 00 | |
| Total freight | | $196,930 00 |

From passengers:

| | | |
|---|---|---|
| First-class | $88,870 00 | |
| U. S. troops | 14,700 00 | |
| U. S. mails | 6,487 48 | |
| Total passengers | | $110,057 48 |
| Total estimate | | $306,987 48 |

—The railroad transfer business is very active at Duluth. On an average 100 freight cars are received and forwarded daily.

## LOCOMOTIVE STATISTICS.

### Louisville, Cincinnati & Lexington.

The following is the report of locomotive service for the year ending June 30, 1870:

Number of miles run by

| | |
|---|---|
| Passenger trains | 376,168 |
| Freight " | 170,543 |
| Distributing " | 74,184 |
| Total | 620,895 |

The cost per mile run was for

| | |
|---|---|
| Ordinary repairs | 3.46 cts. |
| Repairs due to accidents | .73 " |
| Oil, waste, &c | 1.43 " |
| Fuel | 9.46 " |
| Engineers and firemen | 7.73 " |
| Cleaning | .89 " |
| Water supply | 1.09 " |
| Total | 24.79 cts. |

Number of miles run to

| | |
|---|---|
| Bushel of coal | 1.85 |
| Cord of wood | 34.59 |
| Pint of oil | 11.47 |

The company owned 26 locomotives, nine of its own manufacture, three built by M. W. Baldwin & Co., two from Schenectady Locomotive Works, and twelve from the Rogers Locomotive and Machine Works.

### Allegheny Valley.

Mr. G. W. Glass, Master Machinist of the company, reports for the month of August, 1870:

The number of miles run by trains was as follows:

| | |
|---|---|
| Passenger trains | 30,291 |
| Freight " | 50,370 |
| Ballasting, &c | 7,002 |
| Total | 87 663 |

The cost per mile run was:

| | |
|---|---|
| For repairs | 6.25 cts. |
| " fuel | 4.56 " |
| " stores | .80 " |
| " engineers, firemen and wipers | 7.57 " |
| Total cost per mile run | 19.18 cts. |

Average number of miles run to

| | |
|---|---|
| Pint of oil | 27.09 |
| Ton of coal | 38.96 |

Thirty-two locomotives made mileage during the month. One new 34½ ton locomotive went into service on the 15th and two new ones are building. The length of the road is 132 miles.

## OLD AND NEW ROADS.

### International Railway.

This company advertises in England for bids for the supply of 40,000 tons of Bessemer steel rails, with the requisite quantity of fish plates, bolts and nuts, to be delivered in 1871 and 1872. Bids will be received until November 21 at the office of Commissioners for the construction of the road at Ottawa, Canada.

### Lehigh Valley.

The Pennsylvania & New York Canal and Railroad Company, which operates this road is laying a third rail on the Erie railway from Waverly to Elmira, by which they will be able to run their cars through to Elmira.

### Michigan Air Line.

We learn that the directors of the company met at Jackson on the 4th inst. when the preliminary steps, looking to a consolidation with the St. Joseph Valley Railroad, now running from Niles to South Bend, Indiana, were taken, and a meeting of the stockholders called to meet at the same place to-day to complete the business.

### St. Louis, Vandalia, Terre Haute & Indianapolis.

This road is obtaining a good share of the business between Cincinnati and St. Louis. During the week of the fair at St. Louis it had at one time two car loads of passengers from Cincinnati to St. Louis, who arrived in Indianapolis by the Cincinnati & Indianapolis Junction Railroad.

### St. Louis & Southeastern.

A considerable amount of iron has been received for this road at Shawneetown and tracklaying on the section between Shawneetown and Equality has been commenced. On the western division the road is just about to be opened between Belleville and Mt. Vernon, Ill., about 60 miles, 36 of which has been constructed this year. A track has been laid in East St. Louis to connect its depot building with the old Belleville road, which will afford it an entrance from Belleville for the present. One line of this road is to be extended to Evansville, branching from the main line from McLeansboro, about 30 miles southeast of Mt. Vernon and extending nearly due east thence through Carmi. The contract for constructing this from McLeansboro to Carmi has been let to Gen. E. F. Winslow. With lines to Shawneetown, Evansville and Louisville, the St. Louis & Southeastern promises to be one of the most important roads of Southern Illinois.

### Montgomery & Eufaula.

Large quantities of iron for this Alabama road have been received at Montgomery and 800 men are working on the uncompleted section between Union Springs and Eufaula.

### Cheraw & Salisbury.

A survey of a line has been made from Cheraw, 140 miles nearly due north of Charleston, to Salisbury, North Carolina, about 80 miles a little west of north. In connection with the roads south of Cheraw this would form a direct line from Salisbury southward to Charleston, 240 miles long.

### Fairbury, Pontiac & Northwestern.

Work is progressing on the grading of this road, which is to extend from Streator, the southern terminus of the Ottawa, Oswego & Fox River Valley Railroad, southwestward to Fairbury, on the Toledo, Peoria & Warsaw Railway, about 30 miles, crossing the Chicago & Alton road at Pontiac. It will give the Fox River Valley road a direct connection to the East and afford an outlet in that direction for the excellent coal of Streator.

### Burlington, Cedar Rapids & Minnesota.

Judge George Greene, the President of this company, has signed an agreement to extend this railroad into Winnebago County, Iowa, put a depot within three-fourths of a mile of the Court House in Forest City, and another within one mile of Benson's Grove, by November 1873, for a five per cent tax in the townships of Forest Center and Iowa, free right of way through said townships, and a bonus of $40,000. If this proposition is accepted, the road will probably be located through Clear Lake, on the McGregor & Missouri River road, and not through Mason City.

### Great Western of Canada.

The dividend for the last half-year (recently declared) is 2 per cent. For the corresponding half-year one year ago it was 1½ per cent., and for the corresponding period two years ago, 1 per cent.: so the income of the company appears to have doubled within two years.

### Long Island Railroad.

A second track is to be laid on this line between Hunter's Point and Jamaica this fall, and it is proposed to establish a line of steamers from the terminus of the road across the Sound, to connect with trains to and from Boston. This, however, will not be done before next season.

### Lansing, Ionia & Pentwater.

Of this Michigan road, now completed from Lansing to Greenville, about 50 miles, Mr. Joy writes to a citizen of Pentwater as follows: "I cannot now tell how fast it will be built. The death of Mr. Turner, its first President, has set it back some. It seems now as if the connection by way of Grand Rapids with your place might be first accomplished. Our object is, however, to push the Lansing road as fast as the country can do its part, and our purpose is to bring the business of the Sheboygan & Fond du Lac road across to your place, and thence by rail east. If your people co-operate with us, it is my judgment that you can secure both the direct and continuous road to Chicago, and the most direct road east to terminate at your place."

### Chicago & Michigan Lake Shore.

As soon as this road reaches Pentwater, a line of steamers will connect Pentwater and Sheboygan which lie directly opposite each other and only sixty-five miles apart.

### Richelieu, Drummond & Arthabaska.

This line it is proposed to construct from a point on the St. Lawrence near the mouth of the St. John, about 50 miles below Montreal, in an easterly direction about 60 miles to a point on the Grand Trunk Railway. Mr. Senecal, M. P. has taken a contract to construct, equip and operate the road.

### Knox & Lincoln.

The annual report of this road (from Bath, Me., eastward along the coast to Rockland) shows that the funds necessary for the completion of the road are lacking the sum of $475,000. The expenditures have been judiciously made; and the engineer's report very satisfactorily explains the difference which is found between original estimates and the actual cost of construction. A comparative statement of two estimates, one made August 12, 1868, and one made September 1, 1870, shows precisely each item of difference, the principal of which are earth excavation, ballast and shrinkage, $125,138; rock excavation, $140,177; bridge masonry, $24,136; bridging, $21,850. On the other hand, the cost for the track, main and side, is put at $82,000 less than the first estimate; land and land damages $11,000 less; engines $4,000 and passenger cars $8,000 less.

### Massachusetts Central.

This road is to be constructed from Weston, a few miles west of Boston, nearly due west almost exactly in the centre of the State, through the towns of Wayland, Sudbury, Marlboro, Rutland, Barre, Amherst and others to Williamsburg, a few miles northward of Northampton. It is expected eventually to have termini at Boston and Hudson. It is announced that the contract for the construction has been concluded by the directors with Mr. N. C. Munson, and has been formally signed. Ground is to be broken immediately, and the work carried swiftly forward on a substantial basis. The stock of the road is taken largely by the subscriptions of towns along the line, authorized by an act of the Legislature.

### Central of Iowa.

This road has been in operation for some time from Marshalltown as far north as Hampton. This section of the road, which is called the Second Division, is to be opened for business to Mason City, 28 miles north of Hampton, by the 15th of this month. The First Division, from Moulton on the North Missouri road through Oskaloosa and Grinnell to Marshalltown, will be completed by December 1. Work was commenced on this road last May, and, by the 1st of December, 135 miles of it will have been graded, tied, bridged and equipped. This, with 45 miles built last season, making 180 miles, and its connections with the North Missouri on the south, and the Milwaukee & St. Paul on the north, will make a continuous through line between St. Paul and St. Louis.

### Ohio & Michigan.

The time of receiving proposals for the clearing, grubbing, grading, tieing and bridging this road for the 95 miles between Amboy (on the line between Michigan and Ohio) to Allegan has been extended to the 1st of November.

### The Baltimore & Ohio, Toledo & Michigan.

The Columbus, Tiffin & Toledo, and the Toledo & Michigan Railway companies have been consolidated under the title of the Baltimore & Ohio and Toledo & Michigan Railroad Company. A letter to the Board of

Directors, from J. Edward Conant, dated New York, October 3, says: "Inform your board that I am about "contracting out your entire line of road to responsible "parties, who have just completed a large contract, "and can move a large force upon the road this month."

**Pekin, Lincoln & Decatur.**

About ten miles of track is laid on the west end of this road, and it is expected that the iron will reach Delevan in thirty days.

**Illinois Grand Trunk.**

On this old line from Mendota to Albany, (on the Mississippi eight or ten miles below Fulton), partly graded and abandoned long ago, work has been resumed lately. About 200 men are at work at Walnut Grove, west of Mendota.

**Green Bay & Lake Pepin.**

There are now about eight hundred and fifty men distributed along the route between Green Bay and New London, busily at work.

**Dubuque & Minnesota.**

This company, which proposes to construct a line northwestward from Dubuque, up the Turkey River valley, has formed a combination with the Chicago & Iowa Company and obtained such assurances of capital that it advertises to let the contract for the first 25 miles of the line.

**Burlington & Southwestern.**

A Pawnee City correspondent of the Kansas City *Bulletin* says: "The initial point of the Burlington & Southwestern road in Nebraska, is Rulo; thence it runs directly west, through Falls City and Salem, in Richardson county, and thence to Pawnee City, in Pawnee county, from which place it will, eventually, run west in Nebraska to the point where the Nebraska line crosses the Republican river, and thence to Sheridan on the Kansas Pacific. This road has about eleven miles of iron laid—from Rulo to Falls City—and the greater part of the work, preparatory to tying, to Humboldt, within fifteen miles of Pawnee City. There is scarcely a doubt but that the cars will be running on this road, to Pawnee City, before the 1st of June, 1871."

**Macon & Augusta.**

This road was completed to Milledgeville three years ago; but the section between Milledgeville and Macon, 30 miles long, has dragged wonderfully. This year it was expected to have it completed by the 1st of October, but the vessel with the iron has been delayed and has not yet arrived. Only five miles of track remains to be laid, but the road is open for business only ten miles west of Milledgeville.

**New Freedom & Westminster.**

A survey for this proposed new Maryland Railroad has been commenced. It is proposed to construct it from New Freedom, Pa., where the Northern Central Railway crosses the Maryland line, southwest about 20 miles by the Chestnut Hill ore banks and Bachman's Mills to Westminster, which is on the Western Maryland Railroad.

**Chicago & Iowa.**

The grading of this road will be completed from Aurora to Rochelle, in Ogle county, a distance of 42 miles, within the next three weeks. The ties are now at Aurora and the iron at Chicago. The contractors promise to have the whole line competed by the 15th of December.

The company have lately entered into a contracts by which they agree to lease the Dubuque & Minnesota and the Dubuque, Bellevue & Mississippi roads, paying an annual rental of 30 per cent. of their gross earnings, and all taxes and assessments on the property. They are to receive the road as fast as constructed in sections of ten miles. They also guarantee the first mortgage bonds of the leased roads at the rate of $17,000 per mile, and agree to pay the cash for them at 80 cents on the dollar, and to pay as much more for them as they can realize after paying commissions and expenses of sale, the bonds to be cashed as fast as each ten miles of the road is completed. The bond is to be an eight per cent. currency bond, to run 30 years, with interest payable semi-annually. The arrangement includes the Mississippi line to La Crescent, and the Turkey Valley line to Elkader, with a provision for building beyond Elkader as fast as may be thought advisable. In case the rent should not be sufficient to pay interest on the bonds at first, the lessees will advance the money and charge it against rent yet to accrue. The machine shops of the combined roads are to be located at Dubuque, and the roads operated as one continuous line.

**Kansas City & Memphis.**

A Springfield, Mo., dispatch says the County Court of Green county have modified their order of last June, taking four hundred thousand dollars stock in the Kansas City & Memphis Railroad, so as to permit work to commence at Springfield, and grading north and south will begin forthwith. On the completion of the grading and bridging of every five miles fifty thousand dollars of county bonds will be issued to the company. The work is to be completed within two and a half years.

**Portsmouth, Great Falls & Conway.**

Proposals for construction of this New Hampshire road will be received at the office of the Eastern Railroad in Boston until the 20th inst. Twenty-six miles are now in operation, and it is intended to extend the road southward down the west bank of the Piscataqua to Portsmouth.

**Shepang Valley.**

Bids for the grading, masonry and bridging of this line from Litchfield to Hanleyville, Conn., 32 miles were opened at Litchfield on the 10th inst.

**Grand Rapids & Indiana.**

It was Monday the 10th and not the 3d that this road was opened for business through from Fort Wayne to Paris, Mich., 200 miles. A Pullman sleeping car is to run between Grand Rapids and Chicago by way of Kalamazoo over this road and the Michigan Central.

**Eel River Railroad.**

This road was originally planned to run from Butler, DeKalb county, Ind., 81 miles west of Toledo on the air line of the Lake Shore & Michigan Southern, in a southwesterly direction to Logansport, about 70 miles, making in connection with the Southern a very direct route between Toledo and Logansport. Now that the Toledo, Wabash & Western and the Southern are so harmonious, it is not likely that the latter will care for another route to Logansport, but by making the terminus at Auburn, ten miles southwest of Butler, a connection will be made with the Fort Wayne, Jackson & Saginaw road and Detroit. Work has been resumed on the line between Manchester and Columbia city. The Union Construction Company have contracted to have the road completed from Logansport to Butler, DeKalb county, Indiana, by the 1st of November, 1871.

**Alexandria & Fredericksburg.**

Bids for the grading and masonry on this line between Alexandria, Va., and a connection with the Richmond, Fredericksburg & Potomac Railroad a little above Fredericksburg, a distance about 30 miles, will be received until the 31st inst. at the office of the President, G. B. Roberts, in Alexandria. Proposals may be made for one or more sections of about one mile each.

**Rockford, Rock Island & St. Louis.**

This company will make its connection with Rock Island by a line from Monmouth to Orion and thence on the Peoria & Rock Island Railroad 18 or 20 miles to Rock Island. It has laid iron on the grade of the Peoria road from Coal Valley to Orion, seven or eight miles, and is running trains over it. A new town, to be called Delaware, is being laid out on the line, between Medora and Sheffield.

## MECHANICS AND ENGINEERING.

**Great Tunnel Under the Severn.**

*Herapath's Railway Journal* has the following concerning a proposed railroad tunnel under the Severn for the Great Western Railway of England which surpasses in extent the proposed tunnel under the Detroit River for the Great Western Railway of Canada and the Michigan Central:

"Under concession from the Board of Trade, the construction of a portion of the tunnel under the estuary of the Severn, at the new passage, can be commenced at once. The tunnel will be about 4 miles long. Upon its completion that part of the railway could be used, by means of which the distance by railway between Salisbury and other towns in the counties of Somerset, Wilts, and Dorset, and Smith, and Wales would be shortened to the extent of 61 miles.

"The works will be commenced under the direction of Mr. Hamilton Fulton, the engineer who designed the plan of the line some years ago. It is believed the tunnel can be completed, if the necessary capital is forthcoming, in two years' time. The shafts by which the excavation of the tunnel will be removed will be comparative shallow and inexpensive. They can be made at short intervals, without incurring any great extra amount of outlay, and so much accelerate the time of completion. It may be mentioned that the tunnel under Mont Cenis is 7 miles long, and that the excavation has all been made from the two ends or "faces," owing to the great height of the summit, which has caused tardy and expensive progress. In the case of the Severn tunnel, the works will be carried on at twenty-four different "faces," and as the material to be removed consists of either marl or red sandstone, the safety and economy of the work are, it is said, pretty well insured, and Mr. Fulton estimates the cost at £90,000 per mile. The present amount of coal raised annually in the South Wales district is about 6 millions of tons. Two millions of tons, if this line were made, would, it is believed, be carried over the Great Western Railway to London."

**Utah Coal.**

The coal veins of the mines on Bear River, Utah, near Evanston on the line of the Union Pacific Railroad and about 60 miles northeast of Salt Lake City, are 42 feet thick. Of the quality of the coal the Omaha *Herald* says: In heating power, it ranks next to anthracite, and being utterly free from even a trace of sulphur, yielding 72 per cent. carbon, and only 2¾ per cent. ash, without the least clinker, we leave the reader to judge of its excellence.

**Kennebec Bridge at Augusta.**

A correspondent of the *Official Railway News* says of a new bridge in Maine: "The new iron truss bridge over the Kennebec river at Augusta, just completed by Kellogg, Clark & Co., of Phœnixville, Pa., cost nearly $100,000. As it now stands, it is one of the most perfect pieces of ingenuty and skill to be seen in New England. The entire structure is 846 feet long, with five spans, four of which are 175 feet in length, and the other 150. Each span is formed of two parallel "trusses," 14 feet apart and 27 deep, reaching from one side of the river to the other, and supported by wrought iron columns 20 feet high, which stand upon solid foundation piers of stone. The top of the frame work is 81 feet above the water, and, notwithstanding this great elevation, our correspondent says that it did not settle more than half an inch when tested by the weight of a train heavily laden for that purpose."

**Boiler Priming.**

A correspondent writing to the *English Mechanic* says:

"The great cause of priming may be attributed to the want of water surface for the free evolution of steam. In this case 4½ cubic feet of steam must be evaporated per second to supply a 50 horse-power engine; and the minimum space for this purpose is 4½×12=54 square feet must be allowed before the steam can liberate itself from its water of formation with any kind of freedom.

"From the calculation of this boiler, we find the water surface is only 25 square feet, being so much deficient in this requirement; the result is wet steam and priming; and the quantity of water carried over will be in proportion to the difference between the required and given surface of the boiler in question.

"All the best engineers, from Watt downwards, have allowed about 5 square feet per horse-power for the free evolution of steam, but unfortunately this boiler only gives ½lt., giving a ratio of 10 to 1 against the usual practice, and a ratio of 2 to 1 against that which is absolutely necessary; showing that this kind of boilers are always subject to priming when hard pressed for steam, followed, of course, by a great waste of water and fuel.

"Pure water, however cold, cannot produce priming. Rapidity in the production will produce priming only with a deficiency in the evaporating surface. The steam space in this case does not cause priming, as it bears a relation to the draught of steam per second of at least 20 to 1, which is sufficient in any case. The means of drawing off the steam will not cause priming, as it is sufficiently removed from the water surface that any capillary attraction which may arise from the side of the boiler is prevented. Therefore, the great cause of priming in this case may be said to be the want of evaporating surface.

"In order to maintain the full power of the boiler, it would be necessary to take off the steam by means of a steam chest, where the globules of water would fall to the bottom by means of their greater density, and thrown back to the boiler by means of a connection below the water-line of the boiler, as any attempt to throw it in above the water-line would be fruitless, as the water would always be kept in suspension by the superior force of those arising from the surface along with the steam."

**Natural Forces.**

The best writings on these subjects are scattered through many papers in the scientific periodicals and transactions; few of the text books go fairly into the principles. Grove's "Correlation of the Physical Forces" was the first work on the subject. Tyndall's "Heat as a Mode of Motion," worked out the idea for that force, and Balfour Stewart's "Elementary Treatise on Heat,' and Cazin's excellent little work, "Phenomena of the Laws of Heat," are valuable contributions. Electricity remains yet in some confusion; even such a man as Tyndall feebly talks about the advantages of, for the present, working from the supposed two electricities, though admitting that there is probably no such thing at all as electricity.—*English Mechanic.*

**Omaha Bridge.**

The work for the Omaha Bridge is progressing rapidly, and it is the expectation of the parties in charge that the bridge will be ready for the passing of trains within a year. The foundations consist of eleven piers, formed of cast iron tubes 8½ feet in diameter, which are sunk to the bed rock underlying the river at a depth varying from 40 to 73 feet below the surface of water. Work is

in progress on seven of the piers, and will be commenced on the remaining four piers in a few weeks. The pneumatic process is used in sinking the columns for the deeper piers, but when the bed rock is within 50 feet of the surface of the water, it has been found practicable to sink the columns without resorting to that prrcess.

The spans are 250 feet each, to be elevated 50 above high water, making the entire height of the longest pier 145 feet above the bed rock.

L. B. Boomer & Co., of this city are the contractors for furnishing all the iron work to be used in the construction of the piers and superstructure.

### Improved Telegraphic Instrument.

Mr. George M. Phelps, superintendent of the workshops of the Western Union Telegraph Company, New York, has recently brought out and put to use two printing instrument of great simplicity, adapted to private telegraphs for factories, city reporting, and families. One is adapted for two wires, the second for one.

### The Brooklyn Suspension Bridge Caisson.

The work on the East River Bridge foundations is progressing steadily, and it is expected that the caisson will be placed in its permanent bed about the 1st of February. The masonry of the tower will then be begun and carried up as rapidly as may be practicable. The caisson for the New York tower of the bridge is now building by Messrs. Webb & Bell, at the ship-yard at Greenpoint. It will be somewhat different from the one at the Brooklyn side. The entire chamber of the new caisson will be lined with heavy plate iron, of which about 90 tons will be required. Pier No. 29, on the New York side, has been purchased by the Bridge Company, as well as half of the ship and the ferry-landing at the foot of Roosevelt street. The company expect to commence tearing up and removing the pier and making excavations for the caisson in about two weeks. A crib and dock are also to be built, that all may be ready by the time the builders have the caisson launched and completed. The excavation, it is thought, will not exceed 90 feet, as good bed-rock has been found at depths ranging from 86 to 96 feet. The work on the towers will take about two years to complete, after which the construction of the main cables will be begun.—*New York Tribune, Oct.* 10.

## ELECTIONS AND APPOINTMENTS.

—At a meeting of the Board of Directors of the Pennsylvania Railroad Company, held on the 3d inst., the appointment of Charles E. Pugh as General Agent at Philadelphia was confirmed. The appointment dates from August 1st, 1870. Mr. Pugh succeeds the late Mr. G. C. Franciscus, whose death some weeks ago was widely regretted.

—At a meeting of the stockholders of the Buffalo & Washington Railroad Company, on the 7th instant, the following directors and officers were elected: Bronson C. Rumsey, President; Henry A. Richmond, Vice-President; H. L. Lyman, Secretary and Treasurer; Directors, Thomas Clark, James Brayley, Myron P. Bush, Cyrus Clark, E. Henry, A. Richmond, J. F. Schoellkopf, C. J. Hamlin, Sherman S. Jewett, Bronson C. Rumsey, Jonathan Scoville, Walter Cary, Wm. G. Fargo and A. M. Benton. The new board of directors is the same as last year's with the exception of Messrs. J. F. Schoellkopf, C. J. Hamlin and Walter Carey, who have been elected in the place of Messrs. James Adams, John Wilkeson and F. L. Stowell, members of the old board.

—At the annunl meeting of the stockholders of the Grand River Valley Railroad Company, held in Jackson on the 4th, the following were elected directors for the ensuing year: Amos Root, M. A. McNaughton and W. H. Withington, of Jackson; Henry A. Shaw, of Eaton Rapids; Ed. W. Barber and E. S. Lacy, of Charlotte, and N. Barlow, of Hastings. The board of directors subsequently organized by the election of Amos Root, President; M. A. McNaughton, Vice-President; E. S. Lacey, Treasurer, and Ed. W. Barber, Secretary.

—At the meeting of the board of directors of the Dubuque & Mississippi Railroad, held on the 1st instant, at Dubuque, Mr. J. M. Griffith resigned the Presidency of the company, and Mr. J. K. Graves was elected President in his stead. Mr. Solomon Tuck was chosen to fill the vacancy caused by Mr. Griffith's resignation from the directory.

—The regular annual meeting of stockholders of the Mississippi & Tennessee Railroad Company will be held at Memphis on the 9th of November.

—Mr. S. F. Pierson has been appointed General Passenger and Ticket Agent of the Indianapolis & St. Louis Railroad Company, *vice* Mr. John S. Garland, resigned, dating from October 1. This appears to be in accordance with an arrangement by which the Indianapolis & St. Louis and the Cleveland, Columbus, Cincinnati & Indianopolis are to have a common management, and yet be operated separately.

Mr. Pierson has issued a circular directing that correspondence relating to the passenger business of the Indianapolis & St. Louis Railroad shou'd be directed to him at St. Louis, while that concerning business of the Cleveland, Columbus, Cincinnati & Indianapolis Railway should be addressed to him at Cleveland, as heretofore.

—Mr. Adam Brown, President of the Wellington Grey & Bruce Railway, has resigned on account of the demands of his private business. Colonel McGiverin, a director, has been appointed to fill the vacancy. Mr. H. E. Irving has resigned the secretaryship, and Mr. John, Osborne was appointed instead. The vacancy in the board of direction, caused by the withdrawal of Mr. Brown, was filled by the appointment of Mr. James Stewart.

—At the annual meeting of the stockholders of the Rockford, Rock Island & St. Louis Railroad Company held in Rock Island on the 12th inst., the following persons were elected directors for the ensuing year: H. H. Boody, Leo Lehman, Henry Budge, D. A. Boody, and O. D. Ashley, New York; J. R. Young, Chicago; Calvin Truesdale, Rock Island; John Moses, Winchester, and David Turnbull, Monmouth. J. R. Young was subsequently elected President, and John P. Whitehead, Secretary. The meeting was largely attended, and resolutions were passed commendatory of the management of the road, and expressing the highest satisfaction at the rapid progress with which it is approaching completion

Of the new board Messrs. Moses and Turnbull are new members, succeeding George Greene[of Cedar Rapids and B. C. Coblentz of Sterling. Mr. Young has been Vice President here'ofore, and for months, since the resignation of President Greene, has been General Manager. He was for some time and until lately Secretary of the Chicago & Northwestern Railway Company and is credited by those who know him best with remarkable ability as a railroad financier. It is said that some of the most important steps in the series of events which resulted in the consolidation of the Northwestern as it now is were taken at his instance and through his shrewdness.

—Mr. Sedgley, lately General Master Mechanic of the Michigan Southern Division of the Lake Shore & Michigan Southern Railway, has been appointed General Master Mechanic of the company, in charge of the entire line.

—Mr. John Kirby, Master of Car Repairs on the Michigan Southern Division, has been appointed to take charge of that department over the entire line of the Lake Shore road.

—John S. Garland, late General Ticket Agent of the Indianapolis & St. Louis Railroad, takes charge of a transfer company in San Francisco.

—The annual meeting of the stockholders of the Erie Railway Company was held in New York on the 11th inst. An election was held for three directors for the term of five years, in place of Charles G. Sisson, of Jersey city, Homer Ramsdell, of Newburg, N. Y., and Justin D. White, of New York, whose terms expired at that time. These gentlemen were re-elected by a vote of 300,000 against 3,100 for Shepherd Knapp and Moses Taylor. The following resolutions were presented by Horatio N. Otis, Secretary of the company, and passed by a majority vote of those present:

WHEREAS, Certain legal proceedings have been commenced by various parties in the Courts of this State, or of the United States, against the directors of this corporation, demanding their removal or suspension, and seeking to restrain them from pursuing the policy they have adopted in the management of the affairs of said corporation. And,

WHEREAS, said suits have been founded on the pretence that the stockholders of the company were opposed to the present managers and because of having them removed; and,

WHEREAS, such suits have caused a large amount of expensive litigation, and have in many ways seriously affected the interests of the corporation. Therefore,

*Resolved*, That the stockholders of the Erie Railway Company, in annual meeting assembled, do condemn and protest against the various suits which have been brought for the purpose above-mentioned, and wholly disclaim all sympathy with the purposes and objects of such suits, believing them to have been inspired either by the friends of competing lines, or by persons who in bad faith were seeking to abuse the process of the courts for the purpose of pecuniary profit, and advancing themselves at the expense of this corporation, and that said purposes and objects are of such a nature as could not fairly be exposed to the courts or the public.

*Resolved*, That the stockholders of the Erie Railway Company approve the management of the affairs during the years 1869 and 1870, and approve and ratify all the acts of the Board of Directors, Executive Committee, and chief executive officers from the first day of August 1869, to the present time; and they especially approve and ratify the policy of the officers of the company in seeking to establish connecting lines East and West, and in endeavoring to direct traffic of other roads or lines of transportation to this one line of railway, developing the coal business and increasing its equipment to meet the growing demand, and they also approve and ratify all the acts done in pursuance of this policy, with the view of securing to the Erie Railway Company control of the traffic and connections aforesaid.

*Resolved*, That the stockholders of the Erie Railway Company approve and ratify the classification of the Board of Directors, made during the past year, in pursuance of the instructions of a meeting of the stockholders of this company, held on the second Tuesday of October, 1869.

During the election, notices of protest were served by the representatives of the English stockholders and also in behalf of a number of American stockholders, protesting against the elections as unfair, irregular, illegal and fraudulent. These notices were served upon the three Inspectors of Election and upon Horatio N. Otis, Secretary of the Company.

## REGISTER OF EARNINGS.

FOR THE MONTH OF SEPTEMBER.

| | |
|---|---|
| Milwaukee & St. Paul (936 miles), 1870 | $88,318 00 |
| " " (825 miles), 1869 | 724,632 00 |
| Increase (11½ per cent) | $83,586 00 |
| St. Louis & Iron Mountain (310 miles), 1870 | $124,124 00 |
| " " " (310 miles), 1869 | 89,966 00 |
| Increase (38 per cent.) | $34,158 00 |
| Pacific of Missouri (355 miles), 1869 | $353,677 00 |
| " " (355 miles), 1870 | 350,613 00 |
| Increase (1 per cent.) | $3,064 00 |
| Marietta & Cincinnati (251 miles), 1869 | $142,014 00 |
| " " (251 miles), 1870 | 132,998 00 |
| Decrease (6⅓ per cent.) | $9,016 00 |
| Central Pacific (890 miles), 1870 | $833,412 00 |
| " " (690 miles), 1869 | 609,788 00 |
| Increase (36⅔ per cent.) | $223,624 00 |
| Chicago & Northwestern (1,157 miles), 1869 | $1,305,672 00 |
| " " (1,157 miles), 1870 | 1,275,171 00 |
| Decrease (2⅓ per cent.) | $30,501 00 |
| North Missouri (476 miles), 1870 | $264,690 00 |
| " " (404 miles), 1869 | 231,662 00 |
| Increase (14¼ per cent.) | $33,028 00 |
| Chicago & Alton (431 miles) 1869 | $506,632 90 |
| " " (465 miles), 1870 | 498,635 51 |
| Decrease (1⅓ per cent.) | $7,987 69 |

## The Effect of Low Through Rates on Intermediate Stations.

A correspondent of the New York *Express* waites as follows:

"While some deprecate consolidation, as calculated to raise the price of fare and freight to the oppression of the public—which might be so more or less to the people of the West, and the people of New York State who use the railways very well know that property has been for a long time transported cheaper from Chicago and other Western cities to New York and Boston than it has been from any intermediate station between Buffalo and Utica, and between Buffalo and Binghamton to New York and Boston. The effect of this discrimination against our own State produces much greater injury than many suppose. By way of illustration, take a manufactured article that is consumed West and is manufactured at Syracuse or Binghamton, or at any other place in the State, and at Boston or Lynn Mass., or in New York, and see how it works. The freight, we will assume, is 20 per cent. on the cost of the article transported. It is carried between New York, Boston or Lynn and Chicago, St. Louis or to any of the Western cities at one half the price of freight that is carried from Syracuse, Binghamton, Elmira or Rochester to the same Western cities, and *here is a discrimination of* 10 *per cent. against our State* and in favor of Western and Eastern cities. I know this operates very injuriously upon many large manufacturing interior cities and establishments. When a case of shoes or boots, or any other manufactured article, costs nearly double to be transported from Albany, Troy, Poughkeepsie, Schenectady, Utica and Syracuse to the Western cities and States, than it does from New York, Boston and other Eastern cities, it is very injurious and should not be tolerated. Consolidation of railway interest may reach other States injuriously, but it can hardly be worse to our own State than it is now. Troy and Albany having large manufacturers of stores and heavy machinery, consumed in the Western States, feel this injustice keenly, but they have no remedy. Their business is materially injured by this inequality of freights upon the railways. Consolidation will make it no worse than it now is. Many manufacturing establishments have been broken up in the central cities of this State by this demonstration against them in freights upon their own railways.

—Mr. Wm. Orton, President of the Western Union Telegraph Company, has recently issued the following modified form of Rule Six of the company concerning the transmission of numbers in messages:

"Where messages contain amounts, dates or numbers, require the customer, *in every instance*, to write them plainly in words. If such amounts, dates or numbers, after being plainly written in words, be also duplicated in figures *by the customer*, such figures must be counted as part of the message are included in the check. Figures inserted by the customer must not be erased by receivers or operators; nor will they insert them except at the request of the customer, in which case they will be charged for and transmitted. When amounts are duplicated in figures charge for the figures the same as for the words which represent them."

—Captain William Henry Ford, Master Car Painter of the Boston & Albany Railroad, at its Boston shops, was found dead sitting in a chair at his residence in South Boston recently.

RAILROAD GAZETTE

PUBLISHED EVERY SATURDAY.

## CONTENTS.


| | Page. |
|---|---|
| ILLUSTRATIONS. | |
| Standard Rail Sections | 49 |
| Link Motion | 53 |
| CONTRIBUTION. | |
| Whipple on Bridge Building | 49 |
| SELECTIONS. | |
| Railroad Subsidies | 50 |
| Iron Interest | 50 |
| Gauge for Railways of the Future | 51 |
| Submarine Cables | 52 |
| Color Blindness in Railroad Employes | 54 |
| Liability for Fires from Locomotive Sparks | 52 |
| New Harlem Bridge | 53 |
| Railroad Signals | 54 |
| Complicated Railroad Litigation | 54 |
| Boiler Inspection | 54 |
| Memphis & Charleston R. R. | 61 |
| Inspection of Erie Stock Transfer Books Refused. | 61 |
| Western Union Telegraph | 61 |
| SELECTIONS. | |
| Effect of Low Through Rates on Intermediate Stations | 57 |
| GENERAL RAILROAD NEWS. | |
| Traffic and Earnings | 55 |
| Locomotive Statistics | 55 |
| Old and New Roads | 55 |
| Mechanics and Engineering | 56 |
| Elections and Appointments | 57 |
| Register of Earnings | 57 |
| Miscellaneous | 61 |
| EDITORIALS. | |
| Illinois Central in Iowa | 58 |
| To Master Mechanics | 58 |
| Municipal Aid to Railroads | 58 |
| American Institute Fair | 58 |
| Conductors' Life Insurance Company | 59 |
| CHICAGO RAILROAD NEWS | 60 |
| NEW PUBLICATIONS | 60 |


## INDEX TO RAILROAD ADVERTISEMENTS.


| | Page. | | Page. |
|---|---|---|---|
| Chicago, R. I. & Pacific | 66 | Chi., Burlington & Quincy | 68 |
| Kansas City, St. Joseph & Council Bluffs | 66 | Chicago, Alton & St. Louis | 68 |
| Milwaukee & St. Paul | 66 | Hannibal & St. Joseph | 68 |
| Leavenworth, Lawrence & Galveston Railroad | 66 | North Missouri Railroad | 68 |
| Kansas Pacific | 66 | Pacific Railroad of Missouri | 68 |
| Chicago & Northwestern | 67 | Pennsylvania & Ft. Wayne | 69 |
| Pan-Handle | 67 | Erie Railway | 69 |
| Western Union | 67 | Illinois Central | 70 |
| | | Michigan Southern | 70 |
| | | Michigan Central | 71 |


## Editorial Announcements.

*Correspondence.—We cordially invite the co-operation of the Railroad Public in affording us the material for a thorough and worthy Railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.*

*Inventions.—Those who wish to make their inventions known to railroad men can have them fully described in the* RAILROAD GAZETTE, *if not previously published,* FREE OF CHARGE. *They are invited to send us drawings or models and specifications. When engravings are necessary the inventor is expected to furnish his own engravings or to pay for them.*

*Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.*

*Engineering and Mechanics.—Mr. M. N. Forney, Mechanical Engineer, whose office is at Room 7, No. 72 Broadway, New York, has been engaged as Associate Editor of this journal in charge of these departments. He is also authorized to act as our agent*

*Change in Rates.—On and after the 1st of January next, the price of subscription will be four dollars per year. Until that time, subscriptions will be received for periods not exceeding one year at the old rate—three dollars per year.*

☞ *Our Prospectus and Business Notices will be found n the last page.*

## THE ILLINOIS CENTRAL IN IOWA.

Last Monday the Illinois Central Railroad Company took possession of the Iowa Falls & Sioux City Railroad from Fort Dodge to Sioux City. This completes a line from Dubuque to Sioux City directly across the State of Iowa, at a distance of about 70 miles from its northern boundary. This line, which is leased and operated by the Illinois Central Company, was constructed and is owned by two separate companies, who receive a percentage of the earnings as a rental. The Dubuque & Sioux City Railroad Company owns that part of the line between Dubuque & Iowa Falls, 143½ miles, and the Iowa Falls & Sioux City Railroad Company the 183 miles between Iowa Falls and Sioux City. The entire line has been called by the managers the "Iowa Division" of the Illinois Central, but it is best known to the public as the Dubuque & Sioux City road, and this will probably continue to be its popular name.

This is the fourth great railroad stretching across Iowa from east to west, all having direct connections with Chicago. It is noticeable that the distance to the Missouri River from Chicago is nearly the same by all four of these routes, the variations being not more than 25 miles, and the distances varying from 490 to 514½ miles. So far this is the most northerly of the routes, but the Milwaukee and St. Paul Company is constructing a line nearly parallel with and about 40 miles north from it. On the south the nearest line is that of the Chicago & Northwestern, distant generally from 30 to 40 miles. Thus it has a broad belt of country on each side of it whose traffic it will naturally obtain. There will soon be three lines crossing it from north to south, but these can draw very little from its business, as they will form routes to the South rather than to the East. It has itself one feeder from the North, the Cedar Falls & Minnesota Railroad, which extends from Cedar Falls, 98 miles west of Dubuque, in a northwesterly direction to Mona, on the Minnesota line, a distance of 74 miles. Thus the entire length of line in Iowa operated by the Illinois Central is 400½ miles. These lines pass through an extremely fertile country, of which a very small percentage is waste land. As far as Fort Dodge it is pretty well settled, but beyond most of the land is yet to be occupied, and east of Fort Dodge even there is room for double the present population in the country, to say nothing of the towns. The country on the western half of the road is one of the most attractive to settlers in America, land being very fertile, cheap and provided with excellent routes of transportation, the climate acceptable to most emigrants from Europe and the Northern States, and very healthy, the State out of debt and excellently governed, the population of remarkable intelligence and enterprise, and the tide of emigration already turned in that direction with a current that makes it almost certain that the wildest districts in a few years will be like the prairies of Illinois and Eastern Iowa—well populated, well cultivated, and wealthy. So we may expect that immigration to Northwestern Iowa will increase rapidly and that the local traffic on the line of this road will increase very rapidly every year for many years to come.

A further increase may be expected from a proposed extension of the Cedar Falls & Minnesota road through Minnesota east of the Milwaukee & St. Paul line to St. Paul. This extension a company called the Dubuque & St. Paul Company is preparing to make, with excellent prospects of success.

The new line may be said to increase the volume of trade of Chicago by *creating* business, and not by diverting it from other points. The country on the line of this road has long found its best market here, but without direct railroad connection with a market, much of it could not be profitably cultivated. Thousands of square miles of fertile prairie are now brought within half a day's journey or less of a railroad station.

The Illinois Central Company now operates 1,107 miles of road, extending from Minnesota to Cairo, from Chicago to Sioux City. It runs trains through from Chicago to Cairo, from Chicago to St. Louis, from Chicago to Keokuk, from Dubuque to St. Louis, and from Dubuque to Sioux City. It utilizes other roads as well as those it owns or leases, and the Vandalia road has given it an important business which was altogether new to it. The Belleville & Southern Illinois Railroad, soon to be completed from Belleville to Duquoin, will give it a very direct route between St. Louis and Cairo, on which it will run through trains, and through which it hopes to get as large a share of the trade between St. Louis and the South as it now has of that between Chicago and the South. A few weeks will give access to the Ohio River at Shawneetown and a broad district in Southeastern Illinois, by the completion of the Springfield & Illinois Southeastern Railroad, which for some time must give all its Chicago business to the Illinois Central, and is likely always to give it a good part of it. It loses something by the construction of new east and west lines which cross it south of Chicago, but it gains something from these and from other new roads, and more than makes up such losses by the growth of the country on its lines and the increased through travel consequent on the improved and improving condition of the South.

## To Master Mechanics.

The Secretary of the American Master Mechanics' Association calls special attention to the following notice.

No. 53 DEARBORN ST., Chicago, October 12, 1870.

The attention of members is called to the importance of sending their addresses *at once* to the Secretary. The annual report is now being printed and will shortly be ready for distribution. That all may be supplied promptly it will be necessary that the *correct* address of each member be on file in the Secretary's office.

Please address as above,

L. P. DODGE, Secretary, etc.

## Municipal Aid to Railroads.

We desire to call attention especially to an article on "Railroad Subsidies" from the New York *Nation*, which we reproduce on another page. While the subject is closed for the time in this State, it is by no means certain that it is closed permanently, and at least all other States around us are immediately interested in the question. It is one of policy as well as of law, and the arguments on either side are weighty.

In the October number of the *American Law Review* there is an elaborate and learned review of the decision of the Supreme Court of Michigan which declared the Railroad Aid Law of that State unconstitutional. The review analyzes the decision carefully and dissents from it entirely. This review we intend to present very soon.

## THE FAIR OF THE AMERICAN INSTITUTE.

Since our last article was written, the *Scientific American* has published a description of the machinists' tools, pumps, wood-working machinery, etc., which says so nearly what we had on our memoranda to say, that we copy that portion of it which will be specially interesting to railroad men. We will only preface what it says in relation to the machinists' tools with an endorsement of the improvement they have observed in the machinery exhibited by Lucius W. Pond, and add the remark that if in the design of these lathes and planers and especially the drill presses useless mouldings and work intended to be ornamental were discarded, the machines would have a much more substantial appearance and "look more like work."

MACHINISTS' TOOLS.

"Lucius W. Pond, of No. 98 Liberty street, New York, shows a fine collection, consisting of one 22 inch lathe with compound rest and cross feed, very strong and powerful; one 32-inch planer—a four ton machine; one 22 inch planer—1½ ton machine, and one upright drill press. Mr. Pond has, within the last two years, completely re-organized his establishment, and now uses entirely new patterns, which give greater power and simplicity to the well-known and highly-appreciated tools of his manufacture. The old Jersey City Locomotive Works have recently been refitted and supplied throughout with Mr. Pond's tools made after these new patterns. The patterns of his lathes have been changed so as to give increased size to the parts which receive strain, and they are in all respects excellent tools. The 32 inch planer is very heavy and powerful, and both it and the smaller one alluded to, run with great smoothness of action. By using a simple train of cut gears and racks to drive the tables of his planers. Mr. Pond does away with stud gears ordinarily used with single belts, and is enabled to increase backing speed at pleasure. This collection of tools will not fail to please all mechanics who examine them.

"The New York Steam Engine Company, Nos. 126 and 128 Chamber street, New York, exhibit one 20-in. planer, one 32-in. lathe, two drill presses, one car-wheel boring machine, a machine for turning nuts, one shaping machine, one slotting machine, and a punching press. These are all fine tools, but the punching press shown is perhaps the most noticeable feature of the collection.

"George W. Moore, of Worcester, Mass., shows in connection with the tools in this inclosure, a simple and useful gauge to turn bevels of gears to agree with the drawing.

"The Union Vise Company, No. 80 Milk street, Boston, Mass., exhibit two beautiful milling machines of different sizes, evidently both excellent tools. They also show a universal head for milling machine or planer, by which spur and bevel gears can be cut, or work held upon an arbor or chuck can be milled at any angle, and in almost any position. They also show a machine for cutting spirals, either straight or conical, right or left hand, and of almost any pitch, the changes being made by the ordinary gears of an engine lathe. They show, lastly, the James Ross Steam Permeator or oil and tallow cup for lubricating the valves and cylinders of steam engines. They are beautifully designed and finished, and rank among the best of this class of devices.

"Cowin & Johnson, of Lambertville, N. J., exhibit a universal lathe chuck, of peculiar construction, in which a socket wrench applied to one end of a worm shaft causes the jaws to simultaneously and firmly grasp the work. The working parts of this chuck are all covered, so as to be out of the reach of dirt, chips, etc., which often interfere with the action of chucks of this class.

PUMPS AND BLOWERS.

"Knowles & Sibley, of No. 126 Liberty street, New York, exhibit various sizes of the Knowles Patent Steam Pump. This pump has neither cranks nor fly wheels. The main steam valve of the pump is not a rotary valve, but is an ordinary flat slide valve. The slight rotary motion given the valve rod simply puts the valve in a position to be driven horizontally on its seat. The steam cylinders are fitted with spring ring packing, with screws and springs, for proper adjustment. The water cylinders are fitted with composition heads and rings, adjustable by screws, or with leather rings or a patent fibrous head, according to the nature of the work required. All the joints are ground to fit, and require no packing. The glands and piston rods are solid composition. The valve seats are composition, and the valves, either rubber or metal, are very durable, and are placed in the pump so as to be easily accessible, and in the larger sizes, for fire or marine purposes, are got at immediately without removing any nuts or bolts.

"J. H. A. Gerricke, No. 169 Broadway, New York, exhibits a turbinate force pump. It consists of a wheel case containing a turbinate wheel secured to a shaft, and having vanes or paddles of different lengths at its curved periphery, which are bent at their discharge ends, closely fitting the space between it and the case, within which it revolves without touching. In the end of the wheel is an anti-friction pin (used in the vertical pumps) which revolves in a female step, secured in the case. An upper chamber contains anti-friction partitions and a bottom plate which withholds the weight of the water from the wheel.

"The Valley Machine Company exhibit a bucket and plunger steam pump, being a vertical steam pump composed of the parts of a simple slide valve and eccentric steam engine attached in a novel and compact manner to a bucket and plunger pump that discharges water at both strokes of the piston. The water valves, which are of either metal or rubber, are placed in such position that access can be had to them by the simple removal of one bolt and without disturbing any of the pipes; the bearing surfaces subject to wear are either lined with Babbitt metal or fitted up with adjustable boxes, so that the wear can be taken up easily, or the bearings replaced at very little expense. These pumps are made by special machinery, and with uniformity of workmanship, which allows of any part being quickly and cheaply replaced when worn out or broken by accident.

"The Woodward Steam Pump Manufacturing Company, Nos. 76, 78, and 80 Centre street, New York, show a fine line of their pumps. These pumps are so widely known, and their reputation is so well established that we may pass them without further comment.

"Charles B Hardick, No. 23 Adams street, Brooklyn, exhibits several sizes of the Niagara Steam Pump. The valves of this pump may be removed by simply unscrewing a single nut, and any carpenter can make in a few minutes a set of valves for it of wood if the original ones should give out.

"William D. Andrews & Brother, No. 44 Water street, New York, exhibit one Central Discharge Centrifugal Pump, and one Antifriction Centrifugal Pump. These pumps have long been before the American public, and are well know as most effective machines of their class.

"George W. Nye, of Monmouth, Ill., exhibits a steam vacuum pump, the details of the construction of which we could not obtain.

"The Rahway Manufacturing Co. exhibit one of Clark's Multiplying Pressure Fan Blowers. This powerful blower produces great intensity of blast with slow speed. Its construction is extremely simple, but comprises some nice scientific and mechanical principles."

In addition to the machine tools, described above, the American Trust Drill Company, of East Blackstone, Mass., exhibit several emery grinders and an assortment of different sizes of emery wheels, which seemed to be of very good quality.

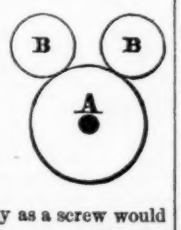
Joseph W. Brockway, No. 283 South Fourth street, Jersey City, exhibits a very neat arrangement for oiling loose pulleys. The shaft when it rests in the journal box, and passes through the loose pulley, has a tube or "sleeve" on it, which is perforated both in the bearing of the journal and the pulley. The shaft has one or more longitudinal grooves cut in it under the sleeve. The oil on the journal therefore, passes through the perforations, and along the groove in the shaft to the bearing of the loose pulley. If, therefore, the journal bearing is oiled, the loose pulley will also be lubricated at the same time.

Several varieties of what are called "incombustible jackets for boilers" are exhibited. All of them, we believe are put on in a plastic condition. This of course dmits of their being applied to any conformation of boiler or steam pipe, which is often a great advantage, as it is very difficult sometimes to fit wooden or felt lagging to a crooked steam pipe, or some of the convex parts of boilers. It is also claimed for these plastic jackets, that they are much more indestructible than felting, and if injured or broken can be repaired as easily as the wall plastering of our houses.

Charles Morrill & Sons, No. 556 Grand street, New York, exhibit a variety of sizes of Pickering's Patent Pulley Blocks, for raising heavy weights. They are of the same general character as the "Differential Pulley Blocks" so much used in machine shops in this country. Pickering's is a European invention, we believe, and has been extensively used in Great Britain and the continent.

A variety of rail joints and nut locks and fastenings are on exhibition, but it would be impossible to describe them intelligibly without a cut of each.

N. Poulson and W. Harnum show a model of an elevated city railroad, the idea of which seems to have some merit, although the model is in a very undeveloped form. The motive power is communicated to the cars in a peculiar way by a sort of continuous revolving drum placed between the two rails. Conceive of a line of hollow shafting about 15-in. diameter laid on the cross ties midway between the rails; and attached to each car two friction wheels which bear on the shafting, or, as we before called it, revolving drum. The diagram below represents the relative position of the drum and the friction wheels, *A* being the drum, *B B* the friction wheels.




It is obvious that if the plane of the wheels *B B* stands at right angles to the axis of *A*, that the car will not be effected by the revolution of *A*. If, however, *B B* are *inclined* to the axis of *A*, in the position of the thread of a screw, it is obvious that if they bear hard enough on the drum *A*, that the car will be moved alongin the same way as a screw would move it. The speed of the car will be governed by the amount of inclination or "pitch" of *B B*. The motion of the car can also be reversed by reversing the inclination of the friction wheels. The originators of this idea describe their invention as follows:

"The invention consists first; in giving a revolving motion to a cylinder lying horizontally mid-way between the two rails; from this cylinder motion is conveyed to the car by means of four friction wheels, placed two at each end, and resting on a pivot or swivel; the wheels straddle the cylinder. At either or both platforms of the car, a wheel or crank (similar to those used for brakes on the ordinary car) is used to work on the friction wheels below, which are turned diagonally, one way to propel the car forward, or diagonally the other way to send it in an opposite direction; or to make a full stop. The friction wheels are turned so that they run at right angles with the cylinder, thus merely revolving without in the least moving the car. This principle of regulating the friction also enables the conductor to graduate the speed at pleasure.

"The invention is best adapted for elevated or underground transit, where there are no obstacles to interfere with the machinery or speed.

"It is applicable for portable railroads—for mining, coal and brick-yard purposes, for manufactures or any purpose in which goods or materials require transportation. The horizontal cylinder may be operated by steam, pneumatic or hydraulic power. The object of this invention is to apply mechanical in the place of horse power for the propelling of city railroad cars."

As stated before, the plan still seems to be in a somewhat crude form, but the main idea looks very promising, and with some intelligent experiments it may be perfected so as to meet what is an acknowledged want in all crowded cities. The friction wheels on the model have rubber tires, the endurance of which in actual use is somewhat doubtful.

There are on exhibition some very beautiful samples of what is called "the pyrographic art." They are panels of wood printed with very beautiful ornamented designs. The trade circular which is distributed says:

"The samples and designs of this work now on exhibition at this Institute, are from the ordinary work manufactured largely in England.

"The process, as indicated by the name, is simply printing by fire through a system of cylinders, which gives on any kind of wood representations of any design required, which is indestructible and from its nominal cost and great beauty must entirely supercede veneering and inlaid work by hand, as solid wood takes the place of either.

"To car and carriage manufacturers, architects, builders, carpenters, cabinet and furniture makers, and all consumers of wood either fancy or plain, this is a desideratum accomplished."

Some of the samples are certainly very beautiful and seemed to us admirably adapted for car work. The trade circular does not give the name of the manufacturer or exhibitor, so we are unable to direct persons who desire further information.

Newman & Capron, corner Twenty-eighth street and Broadway, New York, show an admirable arrangement for the sliding doors of sleeping cars, which we expect to illustrate in a future number.

## Railroad Conductors' Life Insurance Company.

The third annual meeting of this association was held in Philadelphia on the 5th inst. James Marshall of the New York & Harlem Railroad presided. There were in attendance about 200 delegates, representing the 3,298 members of the company.

An address of welcome was delivered by Mayor Fox, of Philadelphia, who eulogized the conductors and enlarged upon the difficulties, dangers and responsibilities of their occupation.

A letter was read from Governor Geary of Pennsylvania lamenting that his engagements did not permit him to be present.

The following address was delivered by the President of the company, Mr. J. M. Marshall:

"My Friends of the Convention—Ladies and Gentlemen.—It is exceedingly gratifying to me to be permitted to greet and to welcome so many earnest men and women who have come hither to this beautiful city of Brotherly Love, from the shores of the Pacific, from the mountains of the North, from the plains of the South, and from the valleys of the mighty West, where empire and law sit enthroned, to participate in and witness the deliberations of the third annual convention of our fraternity. I tender you my sincerest congratulations upon the marvelous success that has attended our organization ever since it came into being, and upon the magnificent future which that success foreshadows. Here, amid sacred and patriotic recollections, upon the spot where the Declaration of Independence first saw the light, and where the American Constitution was born, let us reconsecrate ourselves for the holy mission with which this Association is charged. Let us remember that danger lurks about us every hour we are on duty in our hazardous vocation. Let us never forget that this associated brotherhood has engaged to relieve the wants and distresses of the wives and children and families of those of us who shall perish or be disabled in the service to which our lives are devoted. We do even more than this. Our sorrowing sympathies go along with our money, and they not unfrequently afford far greater consolation than all else can afford, save the consolation which comes from above.

Upon you, my brethren of the convention, is now devolved the duty of so deliberating and acting as that your proceedings shall tend toward perfecting this organization, which is already an unparalleled success. Let nothing turn you aside from the straight line of duty, but let everything be done that ought to be done, and all else be left undone.

I shall not occupy your time by making suggestions and recommendations, but will at once invite you to give your attention to the elaborate and carefully prepared report of our faithful and efficient Executive Committee, which will presently be read by Mr. Amos Layman, of Columbus, Ohio, who is our official reporter, and whose experience and ability eminently fit him for the duties that have been assigned to him.

I invoke now upon you and upon your deliberations the choicest blessings of Heaven, and trust that your proceedings will be characterized by harmony and good feeling, and that all your sayings and doings will redound to the highest success and perfection of our beloved and cherished association."

The report of the Executive Committee was published in the Railroad Gazette a few weeks ago. The following is a summary of it.

From the organization of the association, in October, 1868, to the close of the fiscal year, August 31st, last, there were paid claims on account of forty-one deaths and five total disabilities, amounting in all to $113,787. The first death occurred when there were but 796 members, and of course, the heirs received the sum of $796. The largest claim was paid on the 30th of August last, amounting to $3,980.

The total receipts since the organization have been $8,016.49; disbursements other than for deaths and disabilities, $8,016.49; whole amount of certificates issued for membership, 4,047; forfeited membership, 553; withdrawn, 141; killed, 23; died, 27; disabled, 5; present number of members, 3,298.

The following assessments have been made since the close of the fiscal year, August 31st: Death of E. C. Ackerman, of the New Jersey Central Railroad, $3,011; David Ross, of the Missouri, Kansas & Texas Railway, $2,057; D. G. Al endorph, of the Kansas Pacific Railway, $2,065; C. H. Elyen, of the Western & Atlantic Railroad $2,150; A. G. Black, of the Pittsburgh, Fort Wayne & Chicago Railway, $2,073.

There were also nine cases of total disability since the 31st of August.

An address of some length and unusual interest was delivered by Mr. J. W. Seymour, of the Illinois Central Railroad, who was chosen for that purpose at the meeting of 1869. This address will be printed for the members.

The election for officers in the afternoon resulted in the choice of the following:

*President*—James Marshall, of New York City.

*Vice President*—Samuel Titus, Auburn, New York.

*Secretary and Treasurer*—E. M. Livingston, of Columbus, Ohio.

*Executive Committee*—J. W. Moore, J. N. Horner, N. H. Wood, of Columbus, Ohio.

On the morning of the second day's session the Committee on Credentials reported that the credentials of 165 delegates had been examined and accepted and that thirty more were to be presented.

W. S. Sears, from the Finance Committee, presented a report, showing receipts of $8,016.49 and expenditures of $4,738.88, leaving a balance of $3,277.50

A number of invitations were received and accepted.

The report of the Grievance Committee, J. W. Houghtaling, Chairman, was presented and adopted.

Mr. Samuel Titus, from the Committee on Amendments to the Constitution and By-laws, then made a report, which was received. The constitution was then read by sections and the amendments inserted.

Most of this day's session was spent in discussing the amendments.

On Friday the delegates and their families left in a special train over the Camden & Atlantic Railroad for Cape May, where they spent the day until four o'clock, when they returned to Philadelphia.

### Louisville to Southwest Virginia.

The Lynchburg *Virginian* says the Virginia & Tennessee and the Louisville & Nashville Railroad surveyors were to be put on the work on the 1st inst., and that the two companies are to meet with their improvements at the Cumberland Gap, thus securing a continuous connection between Norfolk, Louisville, Cincinnati, St. Louis and San Francisco. Gen. Mahone declares his intention to push the road to completion as rapidly as possible.

### Canada Southern.

At a meeting of the Council of Elgin county, held a few days ago, the by law granting $20,000 to this project was read a third time and passed. Mr. Courtright said that they wanted to get fifty miles, from Fort Frie to Grand River, finished this fall, so that the iron could be laid down in the spring. Work would be commenced at all heavy points this fall. Bridges would be completed, timbers got out, and the tracts through the wooded districts cleared in the course of the winter.

# Chicago Railroad News.

### The Camden & Amboy in Chicago.

This much-talked-of road has at least not talked much of itself. In all our hotels and stations, among the hundreds of posters, not one bore the name of the Camden & Amboy. In fact, it was not found necessary to solicit business, for it so commanded the approaches to Pennsylvania that the roads of that State were compelled to solicit for it, while it received the business and pocketed the receipts with a "smile that is child-like and bland," as we may very easily believe.

But in some way the Camden & Amboy has been convinced recently that it is for its interest to do part of the work towards obtaining the business which it receives from the West. We have seen in this city within a few days an immense and elaborate framed advertisement, which, in somewhat "stunning" style, gives the following: "Camden & Amboy and Philadelphia railroads. Double track, air line. Pullman palace day and sleeping cars through to New York by this route." There are also smaller posters with big type and striking colors, which indicate that now the Camden & Amboy has "gone in;" it has "gone in to win."

### Suit Against the Union Pacific.

Charles S. Munn, a dealer in railroad supplies of this city, has brought an action in the Superior Court of this city against the Union Pacific Railroad Company, laying his damages at $15,000. He sets forth that he contracted to manufacture and ship to the company 100 of Tobey's switch signals at $102 each, and in pursuance thereof delivered the articles at Omaha last June. They now remain in the possession of the company. The new managers, it is said, repudiate the contract made by Colonel Hammond.

### Michigan Central.

This company has made an arrangement with the just completed Grand Rapids & Indiana Railroad, by which the two companies will occupy union depots at Kalamazoo and Grand Rapids, and the former will take the Chicago business of the line north of Kalamazoo to and from Chicago. It is intended to have two passenger trains daily with cars running through between Chicago and Grand Rapids. About the same time trains on the Grand River Valley Division of the Michigan Central will run through to Muskegon, using the track of the Detroit & Milwaukee road between Grand Rapids and Nunica. Then the Michigan Central will be in position to convey business from Grand Rapids both eastward and westward, and we may expect a considerable increase in business with that growing place by reason of the facilities thus afforded.

### Chicago, Rock Island & Pacific.

On the 13th instant this company took possession of the completed section of the Chicago & Southwestern Railway between Washington and Fairfield, Iowa, 28 miles, and on that day all trains of the Washington Branch commenced running between Wilton and Fairfield. The new stations are Brighton, 15 miles from Washington, and Fairfield.

### Lake Shore & Michigan Southern.

There is likely to be no change in officers on this line consequent upon the resignation of Mr. Phillips. Mr. J. H. Devereux, who has been for some time General Manager with headquarters at Cleveland, assumes Mr. Phillip's duties in addition to his former ones. He was here lately and inspected the affairs of the line at this place.

The business of the road is very satisfactory; passenger trains run full, and the receipts from this source, notwithstanding the low rates, must be very large.

We notice elsewhere the promotion of James Sedgley, late Master Mechanic of the lines comprised of the old Michigan Southern road, to be General Master Mechanic of the entire line, and James Kirby, late Master Car Builder of those lines, to be Master Car Builder of the entire road. These positions have not been filled heretofore, but master mechanics and master car builders have remained pretty much as they were before the consolidations, without any increase or decrease of jurisdictions, and without any head with general supervision of their departments. Both Mr. Sedgley and Mr. Kirby have resided at the Adrian shops. They are widely known as men of unusual ability and skill.

### Chicago & Alton.

The report of earnings for the first week of October shows an increase of 12¾ per cent. over those of last year, the figures being $125,415.34 in 1870, and $111,166.37 in 1869, and the increase $14,248.37.

The magnificent car which this company exhibited at the St. Louis Fair attracted thousands of visitors and unbounded admiration.

### Chicago & Northwestern.

Ten new locomotives from the Baldwin Works have been added to the equipment, recently.

While the freight business shows a considerable increase of late there is a falling-off in passenger business.

### Illinois Central.

The company last Monday took possession of the section of Iowa Falls & Sioux City Railroad between Fort Dodge and Sioux City, a distance of 134 miles. This completes the company's leased line from Dubuque to Sioux City, which is 326¼ miles long, and in connection with the Galena Division of the Northwestern forms a very direct route between Chicago and Sioux City, 514¼ miles,—very little further than the distance to Omaha.

## NEW PUBLICATIONS.

*The Musical Independent.*—This Chicago musical magazine has been one of the most progressive of our periodicals, and has been enlarged and improved again and again until it is now the largest musical periodical in the country, and in excellence there are certainly but two or three which can compare with it. It is now a quarto of 32 pages with a cover, printed on very heavy paper, and is an ornament to a centre-table or a piano.

It is something more than a journal of music, although it is that, giving in this number 16 pages of choice music, but it is moreover a musical journal, giving articles on the science and art of music, musical news, and criticisms of new music which are candid and discriminative, affording a trustworthy guide in the selection of music—something which is very much needed. Lyon & Healy, the publishers, are to be congratulated on publishing a journal of so much value to the musical community and so well calculated to develop a pure musical taste.

*A Treatise on Leveling, Topography and Higher Surveying. By W. M. Gillespie, LL. D. Edited by Cady Staley, A. M., C. E. pp.* 171. *D. Appleton & Co., New York.*

This is a posthumous work of the late W. M. Gillespie, late Professor of Civil Engineering in Union College. He is the well-known author of other works, especially of a work on Land Surveying and another on Roads and Railroads. The present work bears plain internal evidence of being arranged and essentially prepared by him, and it is executed by the publishers in the same style as his work on Land Surveying.

Professor Gillespie was a diligent student and very enthusiastic in his profession. He compiled and arranged, and in this direction he did good service. It is easy for the critic to say that his works might be improved by certain additions, or omissions, or by a different arrangement of topics; but it is greatly to his credit that he produced two leading books on the subject on which he wrote. That they have faults we quickly admit; that they have true merits we strongly affirm. The student who peruses them well finds all the methods which were considered of any importance by the author.

After reading the work before us we involuntarily asked—What's in a name? Higher *Surveying!* One would expect from the title to "leave the things which are behind and pass on to those that are *before;* "but the student who reads this book after he has studied the author's works on Land Surveying (including his article on leveling), and Roads and Railroads, will doubtless be highly gratified to learn that the easiest parts of these works belong to "Higher Surveying." By omitting those articles which are contained in his other works he might easily have reduced the book to less than half its present size.

What the author says is generally good, though not always best, but it is sometimes trifling. For instance, the article on leveling covers 81 pages. In it he treats of the ordinary spirit level, the V level, the transit, the theodolite, a measuring rod, the mercurial barometer, and the aneroid barometer. The method of adjusting the level tubes given on page 22 may be good, but it is not the best method. A better method is to set the level to the right and left of both stakes, and note the line of sight from both directions, either by reading the rod on both, or by marking points on permanent stakes. The difference between the two lines of sight will be double the error. By this method horizontal measurements are unnecessary. Nine forms of keeping the field notes are given, but none of them are so compact as those practical men use at the present time, and several of them are quite obsolete. The author is not disposed to omit any "hint" which it is possible for him to make, no matter how trifling. For instance, on page 46, speaking of difficulties, he says: "Underwood.—If it cannot be cut away, set the instrument on some eminence, natural or artificial." Again, on page 47: "House.—First try to find some place for the instrument from which you can see through by opening doors and windows. Or, find some place in the house where you can set the instrument and see both ways, or hold the rod at some point inside and look to it from front and back. A straight stick may be used if the rod cannot be held upright and the height measured on the rod." Other examples might be given. But it may be well said in defence of such commonplace remarks that, for practical works, it is better to be too profuse than too brief; better write as for a dull student than for a bright, quick one; for one who is plodding than for one who is mature. There is, however, a happy mean, and although no one can expect to secure it, especially in the eyes of all, yet it should be sought. A truly practical work should not be historical. It should omit, or at least subordinate, non-essential and obsolete methods. It should seek not only good, but *the best methods*, which works can only be written by men who understand theory and have learned the wants of practical men.

The latter part of the work before us treats of topographical surveying and drawing, mining surveying, hydrographical surveying and spherical surveying or geodesy. The most elementary and simple processes are set forth in each. Nothing is said of those *higher* geodetical problems which treat of the form of the earth—of those grand triangulations made by the French for determining an arc of the meridian, or of the methods for platting portions of the earth's surface.

*Van Nostrand's Eclectic Engineering Magazine.*—The October number of this valuable periodical has the following articles: Royal Agricultural Society's Engine Trials; Lecture on Telegraphy; Bronze Guns; Swedish Railways; On a New Apparatus for Reducing Chloride of Silver; Natural and Artificial Productions of China; Water—Good, Bad, and Good Enough; On the Manufacture of Iron and Steel by Direct Methods; Heat in the Blast Furnace; The Rifling of Heavy Guns, Silting up the Rivers; War and Water; The Friction of Steam Engines; Steam Road Rollers; Counterbracing as a Means of Increasing the Rigidity of a Bridge Truss; What is Energy? Civil Engineering at the Time of Christ; The Fairlie Engine; The Indian Budget; The Evaporating Capacity of Boilers Heated by Waste Heat from Puddling Furnaces; Reclaiming Land from the Sea; Sanitary Works for Dantzic; Arrangement and Maintenance of Batteries; The Construction of Pier No. 4 of Kansas Bridge; Experiments upon the Strength of Different Systems of Brick and Cement Floors, (Illustrated); The Fosberry Mitrailleur; Formulæ for Strains in Trusses and their Practical Application, (Illustrated); Automatic Boiler Feeder, (Illustrated); Purification of Sewerage; On Wind Force.

The article on "Counterbracing as a Means of Increasing the Rigidity of a Bridge Truss," and that on "Formulæ for Strains in Trusses and their Practical Application," (which contains very elaborate and complete mathematical analyses) are original; most of the others are selected from foreign periodicals.

## WESTERN UNION TELEGRAPH.

*Report for the Year Ending June 30, 1870.*

The annual meeting of the stockholders of this company was held in New York on the 12th inst. The following abstract of the annual report has been telegraphed to the Associated Press:

On July 1, 1870, this company possessed 54,109 miles of poles and 112,191 miles of wire, against 52,099 miles of poles and 104,584 miles of wire at the same time last year, being an increase of 1,910 miles of poles and 7,607 miles of wire during the past year. There has been an increase of 521 officers and 883 sets of telegraphic apparatus.

The gross receipts for the year ending July 1, 1869 were $7,316,918.30; ditto for 1870, $7,138,737.96, a decrease of $178,180.34, or 2½ per cent. The gross expenditures for the year ending July 1, 1870, were $4,910,772.42; ditto for 1869, $4,568,116.85 an increase of $342,655.57, or 7½ per cent. The number of messages transmitted during the year was 22 per cent. more than for the preceding year. The net profits for the year ending July 1, 1869, were $2,801,457.48; ditto for 1870, $2,227,965.54, being a decrease of $573,491.94, or 20 per cent. From Oct. 1, 1869, when the reduced tariff went into operation, to April 30, 1870, the gross receipts were $233,273 98 less, and the expenditures were $186,019.13 more, making a difference in the net earnings of $419,293.11. Thus 74 per cent of the decrease in the net earnings for the year occurred in the first seven months after the reduction in the tolls. Of this decrease in the net earnings $209,623.55 occurred during the months of January and February alone, being 35 per cent. of the decrease for the year. After the reduction of the rates in October of last year, the gross receipts did not come up to those of any corresponding month in the preceding year until May, when they exceeded the same month of the preceding year by $7,755. In July, 187·, the receipts exceeded the same month in 1869 by $36,399.68. In August, 1870, the receipts exceeded the same month of the preceding year by $41,124.38. As the cost of performing an increased amount of traffic increases in a certain proportion with the service, the net earnings did not come up to the amount earned in any corresponding month of the preceding year until July, when they were in excess of the same month for 1869, by $21,281.42. In August, 1870, the net earnings were $218,614.14, being 14,087.56 better than in 1869. From Oct. 1, 1869, when the rates were reduced, to March 1, 1870,—five months,—the net earning were $847,878.73. From March 1, 1870, to Aug. 1, 1870,—five months,—the net earnings were $946,863,921, or 11 6-10 per cent. If the same rate of increase should continue for the next year, the net earnings would amount to $2,486,409.54, which, added to the amount saved by the abolishment of the national tax, would make the net earnings for the year ending July 1, 1871, $2,686,409.54. We may, however, expect much better results than these, for the business for the five months from Oct. 1 to March 1, is generally better than during the five months from March 1 to Aug. 1. Thus from Oct. 1, 1868, to March 1, 1869, the net earnings were $1,207,564.93, and from March 1 to Aug. 1, $1,062,124, showing that the autumn and winter months for 1868 and 1869 were $175,440.93 better than the spring and summer months of 1869, while for the present year the spring and summer months are $98,983.92 better than the preceding autumn and winter months.

The average rate of tolls upon the entire volume of business done for the year ending July 1, 1870, was 20 per cent. less than for the year ending July 1, 1869. The average expense of transmission per message for the year ending July 1, 1870 was 11 2-10 per cent. less than for the year ending July 1, 1869.

The following board of directors for the ensuing year was unanimously elected by the stockholders of the Western Union Telegraph Company; Hugh Allan, of Montreal; Jas. H. Barker, of New York; Roswell S. Burroughs, of Albion; Ezra Cornell, of Ithaca; Horace F. Clark, of New York; Emory Cobb, of Kankakee, Ill.; Alonzo B. Cornell, of New York; Wm. E. Dodge, of New York; Harrison Durkee, of New York; J. Alden Ellis, of Chicago; Norven Green, of Louisville; Augustus W. Greenleaf, of New York; Jno. A. Griswold, of Troy, N. Y.; Jas. H. Howe, of Kenosha, Wis.; Wilson G. Hunt, of New York; Geo. Jones, of New York; Cambridge Livingston, of New York; Edwin D. Morgan, of New York; Wm. Orion of New York; Edwards S. Sanford of Brooklyn; Augustus Schell, of New York; Hiram Sibley, of Rochester; Salmon G. Simmons, of Kenosha, Wis.; Jno. Steward, of New York; Moses Taylor, of New York; Daniel Torrence, of New York; Geo. Walker, of Springfield, Mass.; Edward B. Wesley, of New York· Stillman Witt, of Cleveland.

## Memphis & Charleston Railroad.

*Report for the Year Ending June 30, 1870.*

The Memphis & Charleston Railroad extends from Memphis east through Tennessee, Mississippi, and Alabama to Stevenson, Ala., 272 miles, with branches amounting to 19 miles. Its trains run between Memphis and Chattanooga, using the track of the Stevenson & Chattanooga road between Stevenson and Chattanooga, 38 miles. We give below an abstract of the last annual report:

The earnings of this road for the years ending June 30, 1869 and 1870, wers as follows:

| | 1869. | 1870. |
|---|---|---|
| From passengers | $600,544 37 | $818,903 65 |
| " freight | 478,133 25 | 634,858 22 |
| " mail | 34,371 53 | 34,373 59 |
| " express, etc | 69,710 07 | 57,154 53 |
| | $1,182,759 22 | $1,549,090 39 |
| Expenses, viz; | | |
| Conducting transportation | $254,125 91 | $303,129 55 |
| Motive power | 241,257 22 | 366,7 0 82 |
| Maintenance of power | 200,013 26 | 272,316 92 |
| Maintenance of cars | 86,149 88 | 134,232 14 |
| | $781,546 27 | $1, 80,429 43 |
| Net earnings | $401,212 95 | $468,660 96 |

By resolution of the stockholders, $70,157.50 expended in 1870 for permanent improvements was charged to operating expenses, the construction and equipment accounts being closed.

The operating expenses were 65¼ per cent. of the gross receipts.

The following is a comparison of receipts and expenses per mile of road operated in 1869 and 1870:

| | 1869. | 1870. |
|---|---|---|
| Receipts per mile of road | $4,078 48 | $5,341 69 |
| Expenses " " | 2,694 98 | 3,483 69 |
| Net " " | $1,383 50 | $1,858 00 |
| Receipts per mile run | $1 44.84 | $1 83.89 |
| Expenses " " | 97.71 | 1 19.93 |
| Net " " | $0 47.13 | $0 63.96 |

The movement of cotton during the past and preceding years compare as follows:

Number of bales received at

| | 1869. | 1870. |
|---|---|---|
| Memphis | 61,610 | 64,422 |
| Grand Junction | 5,660 | 1,297 |
| Decatur | 5,461 | 11,270 |
| Stevenson | 405 | 1,302 |
| Chattanooga | 45,410 | 35,142 |
| All other points | 1,033 | 717 |
| Totals | 119,639 | 114,050 |

Number of bales shipped from

| | | |
|---|---|---|
| Memphis | 31,939 | 20,902 |
| Mississippi Central Railroad | 24,598 | 27,074 |
| Nashville & Decatur Railroad | 3,559 | 479 |
| Local points | 61,493 | 65,595 |
| | 119,639 | 114,050 |
| Showing decrease in through cotton | 9,691 bales. | |
| Less increase in local cotton | 4,102 " | |
| Decrease in 1869—'70 | 5,589 bales. | |

The President in his report says:

During the first six months of the fiscal year just ended, we expend for permanent work and charged to construction account, for

| | |
|---|---|
| Bridges and trestles, mainly Florence bridge | $62,702 58 |
| Freight cars | 29,690 32 |
| Real estate (timber land on line of road) | 22,903 15 |
| New passenger cars, locomotives, new iron, etc | 48,104 43 |
| Total | $163,400 48 |
| While for the last six months our extraordinary expenses (charged to operating by resolution of stockholders) were only | 70,157 79 |
| Showing decrease in favor of last six months | 93,242 69 |

With a view of decreasing our expenses, it was determined on the 12th of June to take off one through passenger and one through freight train, the receipts from these additional trains not justifying the expense of running them. We have continued running the double daily passenger train at a loss, hoping, however, that the roads east of us would make the double daily connection through to Eastern cities. Becoming satisfied that it was uncertain as to when they would put on the second train, we determined to withdraw ours.

| | |
|---|---|
| The increase in through freight business, over the preceding year is | $136,677 62 |
| While local freight business increases | 24,447 35 |
| Total | $160,524 97 |

The increase being almost entirely in through business, at comparatively low rates, left us but little net profit, owing in part to our not having engines of proper size and capacity to move such freight to advantage. To remedy this, we are now having built, to be delivered this fall, six heavy freight engines, of the best pattern and with the latest improvements, for this business, which we trust will, in future, give us larger net profits from it. We are also having built one hundred and fifty heavy box cars. These two purchases will be paid for out of the receipts of the coming year. They will add largely to our ability to do all business that may offer, preventing blockades of freight, which have heretofore restricted our operations, and in that way affected our net earnings.

In the last annual report it was stated that the receipts of the road might greatly increase without adding proportionately to the expenses. This, however, has not been the case, as anticipated, for while everything entering into the expenses, especially labor, has increased in cost, the large through freight and passenger business has been done at lower rates than heretofore obtained—resulting from heavy competition. The policy of the company hereafter should be to do no business that does not pay a fair profit, and with this view we have made changes in our local freight tariff, increasing the rates for short distances, effecting the greater portion of our local business, while for greater distances we decrease rates, in order to compete with roads intersecting ours and drawing local business from, and yielding us decreased revenue.

The report of the Chief Engineer shows there was spent

| | |
|---|---|
| In permanent work during first six months and charged to construction and equipment | $163,4 0 48 |
| And for the same kind of work during the last six months of the year charged to operating expenses | 70,157 79 |
| Making total outlay for permanent work | 233,558 27 |
| Against fiscal year ending June 30, 1869 | 226,592 93 |
| An increase of | $ 6,965 34 |

Florence bridge was rebuilt during the past year, and its cost accounts for a large portion of the amount charged to construction during the first six months and about one-third the amount of the extraordinary expenses of the last six months. Besides this we have added to the value of the company's property in putting down two and a half miles of new iron rails, repaired six miles of old rails, put in many new frogs of improved pattern, ballasted five miles of track, filled many trestles, extended sidings, ditched cuts, etc., all contributing greatly to permanently improving the road, and a future reduction of expenses in this department, while the present condition of the track is unsurpassed by that of any road in the South, the principle being to spend more money for permanent work, rather than to make temporary repairs or put up structures requiring frequent renewals at a greater ultimate cost.

We have purchased, for delivery in October, six hundred and fifty tons of steel rails, costing one hundred and twenty dollars per ton placed in the track, to replace worn out iron, the renewal of which with iron would cost ninety dollars per ton. It is expected, however, that the durability of the former will more than doubly compensate for the difference in cost. This, with the building of Flint river bridge, and ballasting two to three miles of track, will embrace the principal expenditures proposed in this department the coming year.

The percentage of expenses to receipts of the road for the next twelve months will be much less than that of the past; and taking into consideration the condition of the entire property, we feel great confidence in the future.

There has been no mateial change in the condition of the several proposed connections since the last annual report. Several roads south of the Tennessee river are progressing slowly in the direction of us. We have recently made a survey of the route from Baxter, a point on the Winchester and Alabama Railroad, via Fearn's Switch and Huntsville, to Gunter's Landing on Tennessee river. We feel assured that, with the aid of the City of Huntsville, county of Madison and individual subscription, we will be able to build the line with small aid from this company—provided the road south meet us at the Tennessee River. With this as an outlet to Atlanta we will save at least $30,000 per annum now paid as tolls on freight to Nashville & Chattanooga Railroad, and greatly decrease the distance of haul, and at the same time give us more net revenue.

The completion of the Decatur & Montgomery road will give us a decided advantage in competing for freights to Southwestern Georgia and Alabama that now go *via* Nashville and Atlanta on the one hand, and New Orleans or Vicksburg on the other.

The roads to the west of us progress slowly. The Little Rock road is completed, excepting the gap of fifteen miles between St. Francis and White rivers and the bridge over the latter. The St. Louis & Iron Mountain Railroad Company are now locating their line. The Memphis & Kansas City line, *via* Springfield, Mo., has not yet been located through the State of Arkansas. We have reports of its rapid progres in Missouri; when completed it will be one of our best feeders, bringing the products of Missouri for shipment over our road to the country south and east of us. This road, in connection with that proposed to Atlanta, before mentioned, will form a much shorter line from the south Atlantic seaboard to Kansas City than any other route.

Feeling satisfied that the improvements of the roadbed made within the past year, and the addition of rolling stock which is now being made, will add greatly to your net earnings, we trust the time is not far distant when you may look for regular dividends.

The company owns 43 locomotives, 2 palace sleeping cars, 24 first-class and 9 second-class passenger cars, 4 postal cars and 9 baggage cars; also 403 box, and 210 platform, 19 stock, 1 pay, 1 wrecking and 1 street car.

During the year reported passenger trains ran 444,484 miles on the road, freight trains 397,876 miles, other trains 112,150 miles—in all 954,510. The average cost for locomotive expenses per mile run was 26.2 cents.

The number of local passenger was 300,261, of which 130,497 were carried eastward, 124,963 westward, and 44,801 were commutation passengers. The number of through passengers were 56,472,—22,940 carried eastward, and 33,532 carried westward.

The directors are as follows: Elected by the stock holders, W. B. Waldron, Geo. P. Beirne, James I. Donegan, Joseph C. Bradley, Albert H. Jones, R. C. Brinkley, Pitser Miller, M. J. W. Wicks, John D. Rather; elected by City of Charleston, W. S. Hastie, Edward Willis; by the State of Tennessee, Joel L. Pulliam, John M. Cormack, J. W. Crocker. M. J. Wicks is President, W. J. Ross, General Superintendent, and Niles Merriwether Chief Engineer.

## Inspection of Erie Stock Transfer Books Refused.

On Monday last Mr. Franklin H. Churchill, of No. 33 Pine street, a holder of shares of preferred stock of the Erie Railway Company, requiring information as to certain transactions of the company, applied at the office to have access to the books in which transfers of stock are entered, such application being strictly in accordance with the right given to him by the statute of this State, which provides that stockholders of any incorporated company, within thirty days before the annual election, shall have a right to inspect the company's books, and without this right no control can be exercised over their own property by the owners of shares, nor any check imposed on the arbitrary power of directors on whose discretion or integrity the shareholders may have no sufficient reason to rely. Mr. Churchill accordingly applied to Mr. Otis, the Secretary of the Erie Company, in whose custody (he was informed by the officers) the books in question were kept, and in reply Mr. Otis informed him that Mr. Jay Gould, the President of the company, was the legal custodian of the books, and that application must be made to him. Mr. Churchill then requested to see Mr. Gould personally, but was informed that he could not do so unless he knew Mr. Gould, and would send in a message, with his name and the nature of the business upon which he called. Mr. Churchill sent in his name, and made a demand for an inspection of the company's books, and received for an answer that the books could not be seen, for the reason that the clerk having them in charge was traveling in the West, and would not return until the latter part of this or the beginning of next week, by which time, owing to the election being fixed for Tuesday next, the required inspection would then be utterly useless!

On the following day (Tuesday) Mr. Churchill went again to the office of the company and inquired for Mr. Gould, and was, in like manner, informed by a clerk that he must send in a message to Mr. Gould explaining his business. Accordingly, he sent in a letter to Mr. Gould reciting the occurrences of the previous day, and formally demanded, in writing, an inspection of the books in question. He was informed by a messenger that Mr. Gould opened the letter, but that he was then engaged. Upon affidavits of these facts, an alternative mandamus was applied for and granted by Judge Barnard requiring the company either to produce their books for inspection or to show cause why they should not be produced. Inasmuch as, owing to the disciplined vigilance exercised by the officers of the Erie Company, service of the order on Mr. Jay Gould could not otherwise be effected, it was found necessary to serve it through the agency of a Deputy Sheriff, who, in the face of determined opposition, made his way into the room where Mr. Gould was and served the papers upon him.—*New York Tribune, October* 10.

## MISCELLANEOUS.

—In a recent case tried in the Wisconsin Supreme Court, in which one Wm. P. Woodward sued the Chicago & Northwestern Railway Company for injuries to his wife received on its road, resulting in her death, and died before the case came to trial, the Court decided that the case could be prosecuted only for the person next of kin *at the time the injuries were received*; and that after his death damages could not be recovered for his and her child, which could, however, have brought an action had the father been dead before the accident.

—Quite an event has just been added to the railway annals of Scotland. The Sutherland railway—the most northerly in Great Britain—has just been opened by the Duke of Sutherland in a run on his own new locomotive "Dunrobin." In this trip he was accompaninied by their Royal highnesses, the Prince and Princess Christian, and a large party of the aristocracy of the neighborhood. The noble duke himself, who is an accomplished engineer, stood on the foot-plate and drove the engine, and beside him sat the Princess and her Grace the Duchess of Sutherland.

—When the Russian American telegraph is completed the following feat is possible: A telegram from Alaska for New York, leaving Sitka, say at 6:40 on Monday morning, would be received at Nicoleaf, Siberia, at six minutes past one Tuesday morning; at St. Petersburg, Russia, at three minutes past six Monday evening; at London twenty-two minutes past four Monday afternoon; and at New York at forty-six minutes past eleven Monday forenoon. Thus, allowing twenty minutes for each re-transmission, a message may start on the morning of one day, to be received and transmitted the next day, again received and sent on the afternoon of the day it starts, and finally reaches its destination on the forenoon of the first day, the whole taking place in one hour's time.

—It appears from an elaborate return that at the close of 1868 the following railway companies, connected more or less with the North and East of England possessed the annexed number of locomotives: Great Western, 867; Lancashire & Yorkshire, 455; Great Eastern, 396; Great Northern, 493; London & Northwestern, 1527; Manchester, Sheffield & Lincolnshire, 270; Midland, 689; Northeastern, 865; Caledonian, 523; North British, 390; Glasgow & Southwestern, 121.

—A Minneapolis paper complains that the freight rates on the St. Paul & Pacific Railroad are so high that it is profitable to haul freight by wagon from Minneapolis for sixty miles on the line of the road.

—During the first six months of this year Belgium exported 19,566 tons of rails to Russia, against 24,202 tons in the corresponding period of 1866; to the Zollverein 18,318 tons, against 2,225 tons; to Turkey 12,356 tons, against 16,463 tons; to France 4,109 tons, against 459 tons; to Italy 3,832 tons, against 9,959 tons; to the United States 2,999 tons, against 4,180 tons; to Sweden 1,700 tons, against 730 tons; to Spain 1,657 tons, against 20 tons.

## WANTS.

☞ Short Advertisements will be inserted under this head at ten cents per line for the first insertion, and five cents per line for each subsequent insertion.

WANTED—Every Railway Traveler in the United States and the Dominion of Canada wants every railway company to use the Thomas Safety Baggage Check. It is in use on over sixty of the best managed roads in the country and has been during the past three years, and not one piece of baggage to which this check has been attached has been lost or miscarried. Every railroad man upon whose road it is in use says:

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All information in reference to the Thomas Safety Baggage Check will be given by addressing G. F. THOMAS, editor Appleton's Railway Guide, 90, 92 and 94 Grand Street, New York.

WANTED—By a young CIVIL ENGINEER of four years' experience in the field, a position to take charge of a party or a Division on construction; or would run a transit or level. Apply to "D. F.," this office.

A CIVIL ENGINEER, who is thoroughly educated in his profession, has had experience in field work for some years, and is especially familiar with leveling and transit surveying, desires an engagement on a railroad. Address, TRANSIT, at the office of the Railroad Gazette.

WANTED—By a practical steam fitter and engineer of considerable experience, a situation to run a stationary engine or as locomotive fireman. Inquire at this office.

WANTED—A Civil Engineer of considerable experience in this and the Old Country is open for an engagement as Divisional Engineer, or in any business connected with Surveying—unquestionable references. Address CIVIL ENGINEER, care of Editor Railroad Gazette.

### Notice to Timber Contractors and Stone Masons.

Saint Paul & Chicago Railway.
Chief Engineer's Office of the Minnesota Railway Construction Co.,
Minneapolis, Minn., Oct. 7th, 1870

PROPOSALS will be received at the office of the undersigned, in Minneapolis, Minn., until the 25th day of October, 1870, at 12 o'clock noon for the Piling, Foundations, Timber, Cribs Caissons and Masonry for a bridge over the Mississippi River at Hastings. The Masonry will be of best class cut work with rock face pitched to a line, except cut waters which are to be dressed smooth and covered with boiler plate iron. Full information can be obtained from J. T. Dodge, Esq., Resident Engineer in charge of the work at Hastings.

D. C. SHEPARD, Chief Engineer
Minnesota Railway Construction Company.

## NOTICE TO CONTRACTORS.

Office of the Ohio & Mich. R'y Co.,
Coldwater, Mich., Sept. 16, 1870.

Proposals will be received at this office until October 17, 1870, for the clearing, grubbing, grading, tieing and bridging of that portion of the line of the Ohio & Michigan Railway extending from the State Line, in the township of Amboy, through the counties of Hillsdale, Branch, alhoun, Kalamazoo, and to the village of Allegan, in Allegan county, a distance of 95 miles

Proposals may be made for one or more sections, or for the whole work.

Proposals will state the proportion of cash, and of Capital Stock of the Company, which will be received for the work.

Plans and specifications will be exhibited at this office on and after the 1st of October next.

The Company reserve the right to reject any or all bids, or to accept such only as may seem to the Directors to be for the best interest of the stockholders.

Sealed proposals to be addressed to JOHN S. YOUNGS, Secretary.

By order of the Board of Directors.
HENRY J. LEWIS, President.

The time of receiving proposals for the above work has been postponed until Tuesday, Nov. 1st, 1870, at 12 M.

By Order of the Board of Directors.
Jno. S. Youngs, Secretary.

TO THE WORKING CLASS.—We are now prepared to furnish all classes with constant employment at home, the whole of the time or for the spare moments, Business new, light and profitable. Persons of either sex easily earn from 50c. to $5 per evening, and a proportional sum by devoting their whole time to the business. Boys and girls earn nearly as much as men. That all who see this notice may send their address, and test the business, we make this unparalleled offer: To such as are not well satisfied, we will send $1 to pay for the trouble of writing. Full particulars, a valuable sample, which will do to commence work on, and a copy of *The People's Literary Companion*—one of the largest and best family newspapers published—all sent free by mail. Reader, if you want permanent, profitable work, address E. C. ALLEN & CO., Augusta, Maine.

*ESTABLISHED 1820.*

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## Mathematical and Engineering INSTRUMENTS.

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## SUPPLIES

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## RAILWAY CAR TRIMMINGS,

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A. H. Gunn, Sec'y. J. M.A. Dew, Ass't Supt.

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## Engineers & Iron Bridge Builders,

OF PHŒNIXVILLE, PA.,

Will henceforth have their Principal Business Office at **410 Walnut St., Philadelphia,** to which all correspondence should be addressed. Circulars, plans and prices sent on application.

## IRON BRIDGES, PIVOT BRIDGES

—AND—

## Turn Tables.

## F. C. LOWTHORP,

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## F. E. Canda,

## BRIDGE BUILDER

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## AKRON CEMENT.

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SOLE MANUFACTURERS.

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Orders of Contractors, Railroads, and Bridge Builders, promptly filled.

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Has Issued a NEW STYLE of

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IN FLEXIBLE CASES,

Which are both cheap and convenient. The following States are now ready: Illinois, Iowa, Missouri, Kansas, Nebraska, Minnesota, Wisconsin, Indiana, Michigan and Ohio Mailable on receipt of 25 cents. They show the counties, towns and railroads and are fine specimens of workmanship.

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M. BAIRD & CO., Philadelphia.

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**The Economical Use of Wood, Coke, Bituminous and Anthracite Coal as Fuel.**

ALL WORK ACCURATELY FITTED TO GAUGES, AND THOROUGHLY INTERCHANGEABLE.

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TRENTON, N. J., and 17 BURLING SLIP, NEW YORK,

WOULD CALL SPECIAL ATTENTION TO THEIR

## MARTIN STEEL!

Acknowledged by all who have used it to be the best material now made for

**Firebox Plates, Locomotive Crank Pins, Piston Rods, Axles,**

And all the finer machine purposes, such as

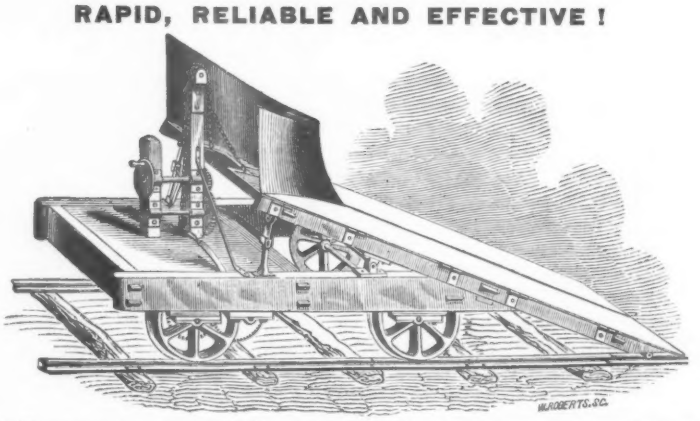
Rollers for Cotton Machinery, Lathe Screws, Sewing Machine Work, &c., &c., &c.

The special features of this Steel are its REMARKABLE TOUGHNESS, its softness and entire freedom from hard spots, which obviate the necessity of annealing before turning.

The process by which this Steel is made differs entirely from any other in use, enabling it to be sold at lower prices than any other good steel, while it possesses properties hitherto unknown, and of the greatest importance for many uses.

## Shaw's Patent Snow Plow!

RAPID, RELIABLE AND EFFECTIVE!



This Plow operates Automatically, as the ordinary Snow Plow. In Clearing Banks of Snow from the Track, It does more Rapid and Effective Work than can be done by any other Machine or Method.

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## Car Plushes.

We invite the attention of Railroad Companies and Car Builders to our extensive assortment of PLUSHES recently imported from France, and which we are offering at old prices, notwithstanding the present European complications, which have generally caused a material advance in this description of goods.

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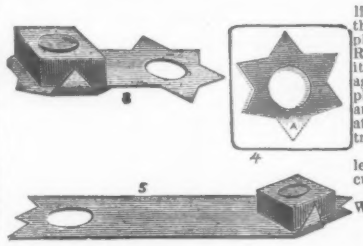
Dealers in Railway Supplies of every description.

## THE UNION PATENT STOP WASHER,



Manufactured at Coatesville, Chester Co., Pa., on the line of the Pennsylvania Central R. R., has now stood the test of practical use on the above road, the Philadelphia, Wilmington & Baltimore and Philadelphia & Reading Railroads, for the past two years, and proved itself to be what is claimed for it—a perfect security against the unscrewing or receding of nuts. Its simplicity, efficiency and cheapness over any other appliance for the purpose should recommend it to the attention of all persons having charge of Railroad tracks, cars and machinery.

It is especially adapted to, and extensively used by leading Railroads of the country for the purpose of securing nuts on railway joints.

The accompanying cuts show the application of the Washer. For further information, apply to

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CAPACITY: 120 WHEELS, 50 AXLES, and 100 HOOKS PER DAY.

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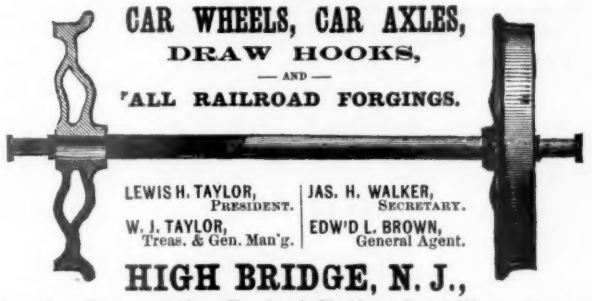
WHEELS AND AXLES, made in the best and most careful manner, furnished separately, or "fitted," making complete sets.



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Are now prepared to receive and promptly execute orders for RAILROAD FROGS and CROSSINGS warranted to prove satisfactory to purchasers

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This Company is by law and by the order of the Supreme Court made a legal depository of money. It will act as Receiver in cases of litigation, take charge of, and guarantee the safe keeping of all kinds of Securities, and collect coupons and interest thereon.

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It is especially authorized to act as Register and Transfer agent and as Trustee for the purpose of issuing, registering or countersigning the certificates of stock, bonds or other evidences of debt of any corporation, association, municipality, State or public authority, and will pay coupons and dividends on such terms as may be agreed upon.

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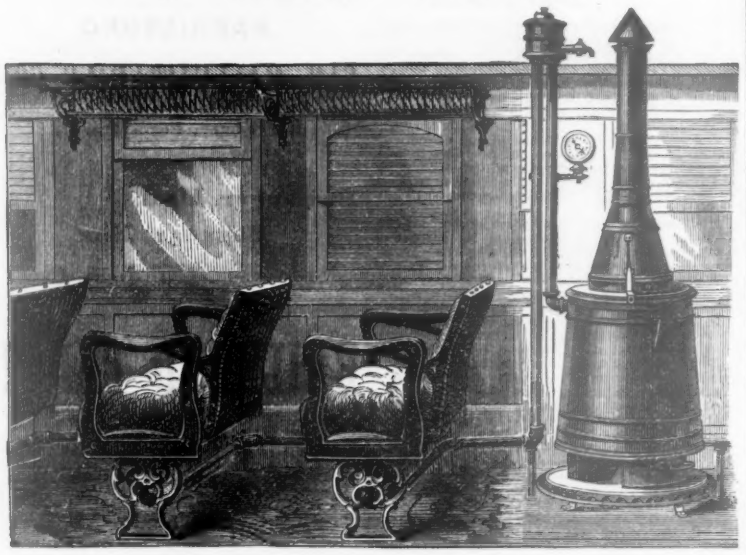

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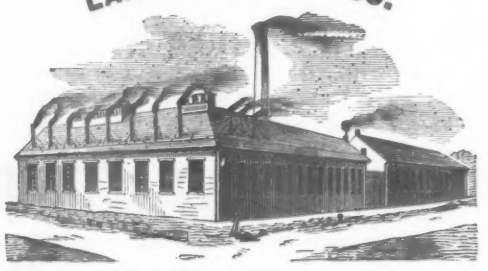

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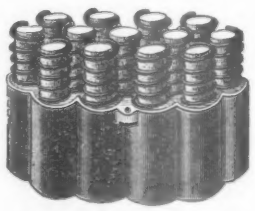

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# The Illinois Central Railroad

ARE PREPARED TO TAKE FREIGHT FOR

**Cairo, St. Louis, Peoria,**

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*And All Points in the Central and Southern parts of the State;*

**MOBILE & NEW ORLEANS BY RAIL OR RIVER**

And ALL POINTS on the MISSISSIPPI below CAIRO. Also, to

**Freeport, Galena and Dubuque.**

☞ Freight Forwarded with Promptness and Despatch, and Rates at all times as LOW as by any other Route.

**BY THE COMPLETION OF THE BRIDGE AT DUNLEITH,**

THEY ARE ENABLED TO TAKE FREIGHT TO ALL POINTS WEST OF DUBUQUE ☞ WITHOUT CHANGE OF CARS! ☜

**DELIVER FREIGHT IN CHICAGO** ONLY at the FREIGHT DEPOT of the Company, foot of South Water St. Parties ordering Goods from the East should have the packages marked:

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**For THROUGH BILLS OF LADING,** and further information, apply to the LOCAL FREIGHT AGENT at Chicago, or to the undersigned.

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ASSETS $1,197,000.

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# Pusey & Pardee,

**74 BROADWAY, NEW YORK.**

# American and English Rails,

**LOCOMOTIVES AND CARS FISH-PLATES, SPIKES, &c.**

*—SOLE AGENTS FOR—*

**Atkins Brothers' Pottsville Rolling Mills, and G. Buchanan & Co., of London.**

☞ Special attention given to filling orders for small T and **STREET RAILS,** of every weight and pattern.

**OLD RAILS BOUGHT OR RE-ROLLED, AS DESIRED.**

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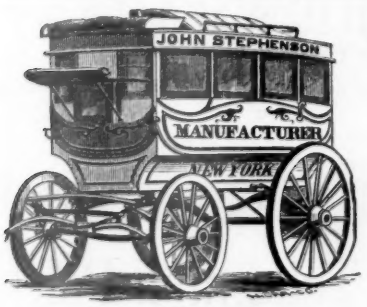


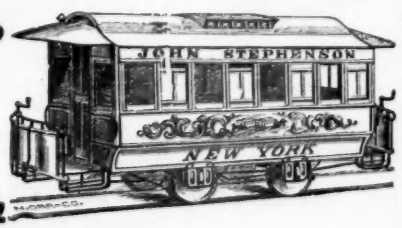

# OMNIBUSES

—OF—

**EVERY STYLE!**

☞ Orders Promptly Filled. ☜

# CARS,




**LIGHT, STRONG**

—AND—

# ELEGANT!

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THE

# "RED LINE!"

—RUNNING OVER THE—

**Michigan Southern and Lake Shore R. R.'s,**

—WAS THE—

**FIRST LINE to CARRY FREIGHT BETWEEN the EAST and WEST,**

**WITHOUT CHANGE OF CARS!**

**CARS RUN THROUGH TO**

# NEW YORK AND BOSTON,

**IN FOUR AND FIVE DAYS!**

☞ Contracts made at the Offices of the Line. ☜

**C. Shutter, Agent,** 247 Broadway, New York. **A. Cushman, Agent,** Old State House, Boston, Mass

**W. D. MANCHESTER, Agent, 54 Clark St., Chicago.**

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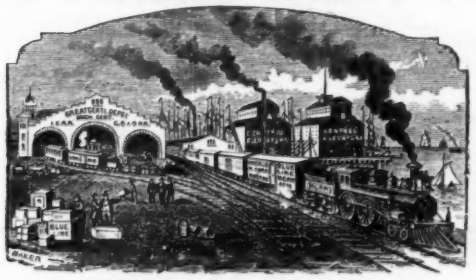
Great Central Route.

# "BLUE LINE."

ORGANIZED JANUARY 1, 1867.

**1870.**



**1870.**

OWNED AND OPERATED BY THE

**Michigan Central, Illinois Central, Chicago, Burlington & Quincy, Chicago & Alton, Great Western (of Canada), New York Central, Hudson River, Boston & Albany, and Providence and Worcester Railroads.**

THE **"BLUE LINE"** is the only route that offers to shippers of freight the advantages of an unbroken gauge through from Chicago to the Seaboard, and to all Interior Points on the line of Eastern Connections beyond Suspension Bridge and Buffalo. All Through Freight is thus transported between the most distant points of the roads in interest.

## WITHOUT CHANGE OF CARS!

The immense freight equipment of all the roads in interest is employed, as occasion requires, for the through service of this Line, and has of late been largely increased. This Line is now prepared to extend facilities for the transit and delivery of all kinds of freight in Quicker Time and in Better Order than ever before.

**The Blue Line Cars**

are all of a solid, uniform build, thus largely lessening the chances of delay from the use of cars of a mixed construction, and the consequent difficulty of repairs, while remote from their own roads. The Blue Line is operated by the railroad companies who own it, without the intervention of intermediate parties between the Roads or Line and the public.

Trains run through with regularity **IN FOUR OR FIVE DAYS** to and from New York and Boston. Especial care given to the Safe and Quick Transport of Property Liable to Breakage or Injury, and to all **Perishable Freight.**

Claims for overcharges, loss or damage, promptly settled upon their merits. Be particular and direct all shipments to be marked and consigned *via*

# "BLUE LINE."

☞ *FREIGHT CONTRACTS* given at the offices of the company in Chicago, New York and Boston.

J. D. HAYES, GEN. MANAGER,.. Detroit

C. E. NOBLE,..... } 349 Broadway, N. Y. | P. K. RANDALL, 69 Washington St., Boston
GEO. E. JARVIS,... } | W. W. STREET,.....91 Lake St., Chicago
N. D. MUNSON,.....Quincy, Ill. | J. JOHNSON,..... Cairo, Ill

**THOS. HOOPS,** GEN. FR'T AGT. Michigan Central Railroad, Chicago.
**A. WALLINGFORD,** AGT. M. C. & G. W. R. R., No. 91 Lake St., Chicago.
**N. A. SKINNER,** Freight Agent Michigan Central Railroad.

---

# Empire Line.

**THE EMPIRE TRANSPORTATION COMPANY'S**

## Fast Freight Line to the East

—AND—

**TO THE COAL AND OIL REGIONS,**

**Via Michigan Southern, Lake Shore, and Philadelphia & Erie R. R.'s,**

**WITHOUT TRANSFER!**

**Office, No. 72 LaSalle Street, Chicago.**

**GEO. W. RISTINE, Western Superintendent,** Cleveland, Ohio.
**W. G. Van Demark,..265** Broadway, New York. | **E. L. O'Donnell,**.....Baltimore, Md
**G. B. McCulloh,....42** South 5th St., Philadelphia. | **Wm. F. Smith,**.....Erie, Penn
**JOHN WHITTAKER,** Pier 14 North River, New York.

**JOSEPH STOCKTON, Agent, Chicago.**

**W. T. HANCOCK, Contracting Agent.**
**WM. F. GRIFFITTS, Jr., Gen. Freight Agent, Philadelphia.**

# CHICAGO, ROCK ISLAND & PACIFIC RAILROAD.

☞ THE DIRECT ROUTE FOR ☜

**JOLIET, MORRIS, OTTAWA, LASALLE, PERU, HENRY, PEORIA,**

**Lacon, Geneseo, Moline,**

ROCK ISLAND, DAVENPORT,

Muscatine, Washington, Iowa City,

**GRINNELL, NEWTON, DES MOINES,**

## COUNCIL BLUFFS & OMAHA!

CONNECTING WITH TRAINS ON THE UNION PACIFIC RAILROAD, FOR

**Cheyenne, Denver, Central City, Ogden, Salt Lake, White Pine, Helena, Sacramento, San Francisco,**

And Points in Upper and Lower California; and with Ocean Steamers at San Francisco, for all Points in **China, Japan, Sandwich Islands, Oregon and Alaska.**

☞ TRAINS LEAVE their Splendid new Depot, on VanBuren Street, Chicago, as follows:

| | LEAVE. | ARRIVE. |
|---|---|---|
| **PACIFIC EXPRESS,** (Sunday excepted) | 10.00 a. m. | 3.35 p. m |
| **PERU ACCOMMODATION,** (Sundays excepted) | 5.00 p. m. | 9.50 a. m |
| **PACIFIC EXPRESS,** (Saturdays excepted,) | 10.00 p. m. | [Mon. ex. 6.00 a. m |

## ELEGANT PALACE SLEEPING COACHES!

Run Through to Peoria and Council Bluffs, Without Change.

☞ Connections at LA SALLE, with Illinois Central Railroad, North and South; at PEORIA, with Peoria, Pekin & Jacksonville Railroad, for Pekin, Virginia, &c.; at PORT BYRON JUNCTION, for Hampton, LeClaire, and Port Byron; at ROCK ISLAND, with Packets North and South on the Mississippi River.

☞ **For Through Tickets,** and all desired information in regard to Rates, Routes, etc., call at the Company's Offices, No. 37 South Clark Street, Chicago, 413 California Street, San Francisco, or 257 Broadway, New York.

A. M. SMITH, Gen. Pass. Agent. HUGH RIDDLE, Gen. Supt. P. A. HALL, Asst. Gen. Supt.

# Leavenworth, Lawrence,

— AND —

## GALVESTON R. R. LINE,

OF KANSAS.

Two Distinct Lines of Road from Kansas City, Mo., and Lawrence, Kan.,

Uniting at OTTAWA, and from thence as a Trunk Line to

## INDIAN TERRITORY.

**The SHORTEST and ONLY DIRECT ROUTE to the celebrated Neosho and Verdigris Valleys of Kansas, and will be opened for business to the Border of Indian Territory, by Nov. 1st, 1870.**

☞ **FIVE DAILY TRAINS, Each Way,** connecting at LAWRENCE with trains the KANSAS PACIFIC ROAD, for WEST and NORTH and at KANSAS CITY with ALL ROADS FOR THE EAST and NORTH, at end of Track with KANSAS STAGE CO.'S LINE OF COACHES for all parts of

## INDIAN TERRITORY, TEXAS & NEW MEXICO.

☞ **Ask for Tickets via L. L. & G. R. R.,** for all points in Southern Kansas. Freight taken from any part of the East to end of track WITHOUT BREAKING BULK.

**CHAS. B. PECK,**
Gen. Freight and Ticket Agent, Lawrence, Kan.

**M R. BALDWIN,**
Superintendent, Lawrence, Kan.

The Great Favorite Route for Missouri, Nebraska and Iowa.

# KANSAS CITY, ST. JOSEPH

— AND —

## COUNCIL BLUFFS

☞ **THROUGH LINE!** ☜

3 EXPRESS PASSENGER TRAINS Leave Union Depot Daily, on the arrival of Eastern Southern and Western Trains, crossing the Missouri River on the New Iron Bridge at KANSAS CITY, passing the cities of

## LEAVENWORTH, ATCHISON, SAINT JOSEPH,

— AND —

## NEBRASKA CITY.

Connecting at COUNCIL BLUFFS with Iowa Lines for all prominent points in Iowa, and making DIRECT CONNECTION at **OMAHA** with the Great **Union Pacific Railroad,** for

**CHEYENNE, DENVER, SALT LAKE, SACRAMENTO, SAN FRANCISCO, And the Pacific Coast.**

## Pullman's Palace Sleeping Cars!

ON ALL NIGHT TRAINS.

☞ Ask for Tickets via the People's Favorite Route, **Kansas City, St. Joseph & Council Bluffs Railroad Line.**

**A. L. HOPKINS,**
Gen. Superintendent, ST. JOSEPH, Mo.

**A. C. DAWES,**
Gen. Passenger Agent, ST JOSEPH, Mo.

# Milwaukee & St. Paul R. W.

THE ONLY ALL RAIL LINE TO

## ST. PAUL AND MINNEAPOLIS!

*AND ALL PORTIONS OF*

## Wisconsin, Minnesota & Northern Iowa.

PURCHASE TICKETS VIA MILWAUKEE.

Passengers Going via Milwaukee,

**Have Choice of Seats in Clean Coaches, and on Night Trains, a full night's rest in Palace Sleeping Cars.**

☞ BAGGAGE CHECKED THROUGH BY THIS ROUTE ONLY! ☜

**PASSENGERS FROM CHICAGO can obtain these Advantages only by the MILWAUKEE DIVISION of the CHICAGO & NORTHWESTERN R'Y.**

**SPECIAL NOTICE.**—Passengers destined to any place in Wisconsin, Minnesota, or Northern Iowa, either on or off the Lines of this Company, who cannot procure Through Tickets to their destination, should purchase their Tickets **TO MILWAUKEE,** as this is the Great Distributing Point for these States.

**A. V. H. CARPENTER,**
Gen. Pass. Agt. Milwaukee.

**S. S. MERRILL,**
Gen. Manager, Milwaukee

# KANSAS PACIFIC RAILWAY.

## Great Smoky Hill Route,

Now Completed and Open for Business Through to

## DENVER, COLORADO.

**There Connecting with the DENVER PACIFIC RAILROAD for CHEYENNE, forming, in Connection with the UNION and CENTRAL PACIFIC RAILROADS, another ALL-RAIL ROUTE to**

## CALIFORNIA, NEVADA, UTAH, MONTANA,

WYOMING, COLORADO, &C.

The most available Passenger and Freight Route to Lawrence, Topeka, Junction City, Abilene, Salina, Hays, KIT CARSON, River Bend, DENVER, CHEYENNE, OGDEN, SALT LAKE CITY,

**Sacramento, and San Francisco.**

☞ Close Connections are made in Union Depots at KANSAS CITY and STATE LINE with Express Trains of the HANNIBAL & ST. JOSEPH, NORTH MISSOURI and MISSOURI PACIFIC RAILROADS.

Southern Overland Passenger and Mail Coaches serve Kit Carson daily for Pueblo, Trinidad, Fort Union, Santa Fe, &c.

Hughes & Co.'s Splendid Concord Coaches leave Denver daily for Central City, Georgetown, &c.

Passenger and Freight Rates always as low and conveniences as ample as by any other Route.

## PULLMAN'S PALACE CARS ACCOMPANY NIGHT EXPRESS TRAINS.

**Through Tickets** can be obtained at all principal ticket offices. Be careful to ask for tickets via Kansas Pacific Railway, "Smoky Hill Route."

## 5,000,000 Acres of Farming Lands For Sale!

Situated along the line of this Great National Railway. For particulars, address JNO. P. DEVEREUX, Land Commissioner, Lawrence, Kansas.

**R. B. GEMMELL, Gen. Freight & Ticket Agt.** **A. ANDERSON, Gen. Supt.**

# THE ERIE & PACIFIC DISPATCH CO.

Are Authorized Freight Agents.

For information, Contracts, and Bills of Lading, apply at their office, 64 Clark Street, Chicago.

H. H. RAPP, AGT.

MARSH & GOODRIDGE.
256 SOUTH WATER ST. CHICAGO.

Dealers in

# R. R. Cross-Ties, Telegraph Poles,

## FENCE POSTS, BRIDGE TIMBER,

**Piles, Hard-wood Plank, &c., &c.,**

To which the Attention of Railroad Contractors and Purchasing Agents is respectfully called.

*REFER TO:*—Jas. M. Walker, Chicago, Pres't L. L. & G. R. R.; Jas. E. & Wm. Young, Chicago, Railroad Builders; H. J. Higgins, Purchasing Agent C. B. & Q. R. R.; and Railroad Officers and Purchasing Agents generally.

## MARSH & GOODRIDGE,

256 South Water St., Chicago.

# CHICAGO & NORTHWESTERN R. W.

**Comprising the PRINCIPAL RAILROADS from CHICAGO Directly NORTH NORTH-WEST and WEST.**

## ALL RAIL TO THE PACIFIC OCEAN!

## Great California Line.

TRAINS LEAVE WELLS STREET DEPOT AS FOLLOWS:

**8:15 A. M. Cedar Rapids Pass** | **9:15 P. M. Night Mail.**
**10:30 A. M. Pacific Express.** | **9:15 P. M. Rock Island Pass.**
**10:30 A. M. Rock Island Exp.** | **4:00 P. M. Dixon Passenger.**

For Sterling, Rock Island, Fulton, Clinton. Cedar Rapids, Boone, Denison, Missouri Valley Junction, Sioux City, Council Bluffs and Omaha, there connecting with the

## UNION PACIFIC R. R.

For Cheyenne, Denver, Ogden, Salt Lake, the White Pine Silver Mines, Sacramento, San Francisco, and all parts of Nebraska, Colorado, New Mexico, Arizona, Wyoming, Montana, Idaho, Utah, Nevada, and the PACIFIC COAST.

| FROM CHICAGO | Hours. | 1st Class Fare. | FROM CHICAGO | Days. | 1st Class Fare. |
|---|---|---|---|---|---|
| To OMAHA,..... | 23 | $20.00 | To SACRAMENTO,. | 4½ | $118.00 |
| " DENVER,..... | 52 | 70.75 | " SAN FRANCISCO, | 5 | 118.00 |

TRAINS ARRIVE:—Night Mail, 7.00 a. m.; Dixon Passenger, 11.10 a. m.; Pacific Express, 3:50 p. m.; Rock Island Express, 3:50 p. m.; Cedar Rapids Passenger, 6:50 p. m.

## FREEPORT LINE.

9.00 A. M. & 9.45 P. M. For Belvidere, Rockford, Freeport, Galena, Dunleith, and St. Paul.
**4.00 P. M., Rockford Accommodation.**
**5.30 P. M., Geneva and Elgin Accommodation**
**6.10 P. M., Lombard Accommodation.**
**5:50 P. M., Junction Passenger.**

**TRAINS ARRIVE:**—Freeport Passenger, 2:30 a. m., 3:00 p. m.; Rockford Accommodation, 11:10 a. m.; Geneva and Elgin Accommodation, 8:45 a. m.; Junction Passenger, 8:10 a. m.; Lombard Accommodation, 6:50 a. m.

## WISCONSIN DIVISION.

☞ Trains leave Depot, cor. West Water and Kinzie Sts., daily, Sundays excepted, as follows:

10.00 A. M. **DAY EXPRESS,** for Janesville, Monroe, Whitewater, Madison, Prairie du Chien, Watertown, Minnesota Junction, Portage City, Sparta, La Crosse, St. Paul, and ALL POINTS ON THE UPPER MISSISSIPPI RIVER; Ripon, Berlin, Fond du Lac, Oshkosh, Neenah, Appleton, and Green Bay.
**3.00 P. M., Janesville Accommodation.**
5.00 P. M. **NIGHT EXPRESS,** for Madison, Prairie du Chien, Watertown, Minnesota Junction, Portage City, Sparta, La Crosse, St. Paul, and ALL POINTS ON THE UPPER MISSISSIPPI RIVER; Ripon, Berlin, Fond du Lac, Oshkosh, Menasha, Appleton, Green Bay, and THE LAKE SUPERIOR COUNTRY.
**5.30 P. M., Woodstock Accommodation.**
**6:20 P. M., Barrington Passenger.**

**TRAINS ARRIVE:**—5:30 a. m., 7:45 a. m., 10:10 a. m., 1:00 p. m. and 7:15 p. m.

## MILWAUKEE DIVISION.

| | |
|---|---|
| **MILWAUKEE MAIL,** | 8:00 A. M. |
| **EXPRESS,** (ex. Sun.) Waukegan, Kenosha, Racine and Milwaukee, | 9:45 A. M. 5:00 P. M. |
| **EVANSTON PASSENGER,** | 11:40 A. M. |
| **HIGHLAND PARK PASSENGER,** | 1:15 P. M. |
| **MILWAUKEE ACCOMMODATION,** with Sleeping Car attached | 11:00 P. M. |
| **EVANSTON ACCOMMODATION,** (Daily,) from Wisconsin Div. Depot | 1:30 P. M. |
| **KENOSHA ACCOMMODATION,** (Sundays excepted) from Wells St. Depot | 4:15 P. M. |
| **AFTERNOON PASSENGER,** from Milwaukee Div. Depot | 5:00 P. M. |
| **WAUKEGAN ACCOMMODATION,** (except Sundays) from Wells St. Depot | 5:25 P. M. |
| **WAUKEGAN PASSENGER,** (Sundays excepted) from Wells St. Depot | 6:15 P. M. |

**TRAINS ARRIVE:**—Night Accommodation, with Sleeping Car, 5:00 a. m.; Day Express, 4:10 p. m. Milwaukee Mail, 10:10 a. m.; Afternoon Passenger, 8:00 p. m.; Waukegan Accommodation, 8:25 a. m.; Kenosha Accommodation, 9:10 a.m.; Evanston Accommodations, 1.40 and 4.00 p. m.; Waukegan Passenger, 7:55 a. m.; Highland Park Passenger, 3.45 p. m.

## PULLMAN PALACE CARS ON ALL NIGHT TRAINS.

**THROUGH TICKETS** Can be purchased at all principal Railroad Offices East and South, and in Chicago at the Southeast corner of Lake and Clark Streets, and at the Passenger Stations as above.

**H. P. STANWOOD,** Gen. Ticket Agt.
**GEO. L. DUNLAP,** Gen'l Supt.

# Western Union Railroad.

CHICAGO & NORTHWESTERN DEPOT, CHICAGO. | MILWAUKEE & CHICAGO DEPOT, MILWAUKEE.

## THE DIRECT ROUTE!

CHICAGO, RACINE & MILWAUKEE,
— TO —
**Beloit, Savanna, Clinton, Pt. Byron, Davenport, Mineral Point, Madison, Freeport, Fulton, Lyons, Rock Island, Sabula, Galena, Dubuque, Des Moines, Council Bluffs,**
OMAHA, SAN FRANCISCO
AND ALL PRINCIPAL POINTS IN
Southern and Central Wisconsin, Northern Illinois, and Central and Northern Iowa.

**FRED. WILD,** Gen. Ticket Agent.
**D. A. OLIN,** Gen Superintendent.

## CRERAR, ADAMS & CO.,

MANUFACTURERS AND DEALERS IN

## Railroad Supplies!

—AND—

**CONTRACTORS' MATERIAL.**

**11 and 13 Wells Street,**
CHICAGO, ILL.

Manufacturers of IMPROVED HEAD-LIGHTS for Locomotives, Hand and Signal Lanterns, Car and Station Lamps, Brass Dome Casings, Dome Mouldings, Cylinder Heads, and Car Trimmings, of Every Description.

# Pan-Handle
— AND —
# Penn'a Central Route East!

☞ SHORTEST AND QUICKEST ROUTE, VIA COLUMBUS, TO ☜

## PITTSBURGH, BALTIMORE, PHILADELPHIA & NEW YORK

On and after Saturday, JULY 10th, 1870, Trains for the East will run as follows:

[DEPOT CORNER CANAL AND KINZIE STS., WEST SIDE.]

**8:10 A. M.** DAY EXPRESS.
[SUNDAYS EXCEPTED.] Via Richmond. Arriving at

| | | | | | |
|---|---|---|---|---|---|
| COLUMBUS .... 2:35 A. M. | HARRISBURG..10:35 P. M. | NEW YORK.... 6:40 A. M. | WASHINGTON..5:50 A. M. |
| PITTSBURGH..12:00 M. | PHILADELPHIA 3:10 A. M. | BALTIMORE... 2:30 A. M. | BOSTON.....5:05 P. M. |

**7:40 P. M.** NIGHT EXPRESS.
[SATURDAYS EXCEPTED.] Arriving at:

| | | | |
|---|---|---|---|
| COLUMBUS...11:15 A. M. | HARRISBURG.. 5:10 A. M. | NEW YORK...12:10 P. M. | WASHINGTON. 1:10 P. M. |
| PITTSBURGH.. 7:05 P. M. | PHILADELPHIA,9.35 A. M. | BALTIMORE... 9:00 A. M. | BOSTON.....11:50 P. M. |

## Palace Day and Sleeping Cars

Run Through to COLUMBUS, and from Columbus to NEW YORK, WITHOUT CHANGE!

## ONLY ONE CHANGE TO NEW YORK, PHILADELPHIA, OR BALTIMORE!

## CINCINNATI & LOUISVILLE AIR LINE SOUTH.

**35 Miles the Shortest Route to Cincinnati.**
**18 Miles the Shortest Route to Indianapolis and Louisville.**

**2 Hours the Quickest Route to Cincinnati!**
THE SHORTEST AND BEST ROUTE TO
**Columbus, Chillicothe, Hamilton, Dayton, Wheeling, Zanesville, Parkersburg, Marietta, Evansville, Lexington, Terre Haute, Nashville,**
ALL POINTS IN CENTRAL & SOUTHERN OHIO, & INDIANA, KENTUCKY & VIRGINIA.
— QUICK, DIRECT AND ONLY ALL RAIL ROUTE TO —
**New Orleans, Memphis, Mobile, Vicksburg, Charleston, Savannah,**
AND ALL POINTS SOUTH.

Cincinnati, Indianapolis and Louisville Trains run as follows:
*THROUGH WITHOUT CHANGE OF CARS!*

| 8:10 A. M. (Sundays excepted) Arriving at | | 7:40 P. M. (Saturdays excepted.) Arriving at | |
|---|---|---|---|
| LOGANSPORT | 1:15 P. M. | LOGANSPORT | 1:30 A. M. |
| KOKOMO | 3:33 P. M. | KOKOMO | 3:45 A. M. |
| CINCINNATI | 9:30 P. M. | CINCINNATI | 10:30 A. M. |
| INDIANAPOLIS | 5:00 P. M. | INDIANAPOLIS | 5:40 A. M. |
| LOUISVILLE | 11:30 P. M. | LOUISVILLE | 5:50 P. M. |

**Lansing Accommodation: Leaves 5:10 P. M. Arrives 8:55 A. M.**

## PULLMAN'S PALACE SLEEPING CARS!

Accompany all Night Trains between Chicago and Cincinnati or Indianapolis.

☞ Ask for Tickets **via COLUMBUS** for the East, and **via "The AIR LINE"** for Cincinnati, Indianapolis, Louisville and points South. Tickets for sale and Sleeping Car Berths secured at **95 RANDOLPH STREET, CHICAGO,** and at Principal Ticket Offices in the West and Northwest.

**WM. L. O'BRIEN,** Gen. Pass. and Ticket Agent, Columbus.
**I. S. HODSDON,** Northwestern Pass. Agt., Chicago.
**D. W. CALDWELL Gen Supt. Columbus.**

# MOORE
# Steel Elastic Car Wheel Co.

OF NEW JERSEY.

Proprietors of
MOORE'S PATENT
FOR THE MANUFACTURE OF
## ELASTIC CAR WHEELS
FOR PASSENGER AND SLEEPING COACHES.
Noiseless, Safe, Durable and Economical.

Also, Manufacturers of
## CAR WHEELS OF EVERY DESCRIPTION.

*H. W. MOORE, President.*
*JAS. K. FROTHINGHAM, Secretary.*
*F. W. BLOODGOOD, Treasurer*

Works, cor. Green and Wayne Sts., JERSEY CITY, N. J
P. O. Address—Box 129, Jersey City, N. J.

# American Compound Telegraph Wire.

**More than 3000 Miles now in Operation,**

Demonstrating beyond question its superior working capacity, and great ability to withstand the elements. For RAILROAD LINES, connecting a single wire with a large number of Stations, and for long circuits, this wire is peculiarly adapted; the large conducting capacity secured by the copper, with other advantages, rendering such lines fully serviceable during the heaviest rains.

Having a core of steel, a small number of poles only are required, as compared with iron wire construction, thereby preventing much loss of the current from escape and very materially reducing cost of maintenance OFFICE AMERICAN COMPOUND TELEGRAPH WIRE CO.
234 West 29th Street, New York.

**BLISS, TILLOTSON & CO., Western Agents,**
247 South Water Street, Chicago.

THE FAVORITE THROUGH PASSENGER ROUTE!

# Chicago, Burlington & Quincy
## RAILROAD LINE.

## 3 THROUGH EXPRESS TRAINS DAILY!

| FROM CHICAGO | Hours. | 1st Class Fare. | FROM CHICAGO | Days. | 1st Class Fare. |
|---|---|---|---|---|---|
| TO OMAHA, - - - | 23 | $20.00 | TO DENVER, - - | 2¼ | $68.70 |
| " ST. JOSEPH, - - | 21 | 19.50 | " SACRAMENTO, - | 4½ | 118.00 |
| " KANSAS CITY, - | 22 | 20.00 | " SAN FRANCISCO, | 5 | 118.00 |

TRAINS LEAVE CHICAGO from the Great Central Depot, foot of Lake Street, as follows:

## BURLINGTON, KEOKUK, COUNCIL BLUFFS & OMAHA LINE.

**7:40 A. M.** MAIL AND EXPRESS, (Except Sunday,) stopping at all stations; making close connections at Mendota with Illinois Central for Amboy, Dixon, Freeport, Galena, Dunleith, Dubuque, LaSalle, El Paso, Bloomington, &c.

**10:45 A. M.** PACIFIC FAST LINE, (Except Sunday,) stopping at Riverside, Hinsdale, Aurora, Leland, Mendota, Princeton, Buda, Kewanee, Galva, Galesburg, and all Stations West and South of Galesburg.
☞ An ELEGANT DAY COACH and a PULLMAN PALACE DRAWING ROOM CAR is attached to this train daily from Chicago

TO COUNCIL BLUFFS & OMAHA WITHOUT CHANGE!

**5.00 P. M.** EVENING EXPRESS, (Daily, except Sunday), in direct connection with the celebrated New York and Chicago Lightning Express Trains of all Eastern Lines, for Burlington, Ottumwa, Des Moines, Nebraska City, Council Bluffs, Omaha, and all points West. Pullman Drawing-Room Sleeping Car attached to this Train daily from Chicago to Ottumwa without change!

**11:30 P. M.** NIGHT EXPRESS, (Daily, except Saturday,) stopping at all principal Stations between Chicago and Burlington. ELEGANT DAY COACHES, and a PULLMAN PALACE SLEEPING CAR are attached to this train from Chicago to Burlington, without change! This is the only Route between

## CHICAGO, COUNCIL BLUFFS & OMAHA,

— RUNNING THE CELEBRATED —

Pullman Palace Dining Cars!

49 MILES THE SHORTEST ROUTE BETWEEN

## Chicago & Keokuk,

*And the Only Route Without Ferrying the Mississippi River!*

## QUINCY, ST. JOSEPH, LEAVENW'TH & KANSAS CITY LINE.

**10:45 A. M.** PACIFIC EXPRESS, (Daily, except Sunday,) with an Elegant Day Coach and one of PULLMAN'S PALACE SLEEPING CARS attached, running through from Chicago to KANSAS CITY, Without Change!

**5:00 P. M.** EVENING EXPRESS, (Daily, except Sunday,) with Pullman Palace Drawing Room Sleeping Car attached, running through from Chicago to QUINCY, Without Change!

**11:30 P. M.** NIGHT EXPRESS (Daily, except Saturday,) with Pullman Palace Sleeping Car attached from Chicago to GALESBURG: Palace Day Coaches from Chicago to QUINCY, Without Change!

64 MILES THE SHORTEST AND ONLY ROUTE BETWEEN

## Chicago and Kansas City!

WITHOUT CHANGE OF CARS OR FERRY.

**115 MILES** The Shortest Route bet. Chicago & St. Joseph.

THE SHORTEST, BEST AND QUICKEST ROUTE BETWEEN CHICAGO AND

## Atchison, Weston, Leavenworth, Lawrence,

AND ALL POINTS ON THE KANSAS PACIFIC R'Y.

Local Trains Leave { RIVERSIDE & HINSDALE ACCOMMODATION, 7:00 A. M. 1:30 & 6:15 P. M.
MENDOTA PASSENGER.....4:15 P. M.
AURORA PASSENGER.....5:30 P. M.

**Trains Arrive**:—Mail and Express, 3:45 p. m; Atlantic Exp., 4:15 p. m., except Sunday; Night Exp, 9:05 a. m., except Monday; Mendota Passenger, 10:00 a. m.; Aurora Passenger, 8:15 a. m.; Quincy Passenger 7:30 P. M.; Riverside and Hinsdale Accommodation, 6:50 and 9 a. m and 5:30 p. m., except Sunday.

**Ask for Tickets via Chicago, Burlington & Quincy Railroad,** which can be obtained at all principal offices of connecting roads, and at Company's office in Great Central Depot, Chicago, at as low rates as by any other route.

**ROB'T HARRIS,** Gen'l Superintendent, CHICAGO.
**SAM'L POWELL,** Gen'l Ticket Agent, CHICAGO.
**E. A. PARKER,** Gen. West. Pass. Agt., CHICAGO

## THE GREAT THROUGH PASSENGER ROUTE TO KANSAS

IS VIA THE OLD RELIABLE

# HANNIBAL & ST. JOSEPH
## SHORT LINE.

Crossing the Mississippi at Quincy and the Missouri at Kansas City on New Iron Bridges; running Three Daily Express Trains, Through Cars and Pullman Sleeping Palaces from Chicago & Quincy to St. Joseph & Kansas City.

The Advantages gained by this Line over any other Route from Chicago, are:

**115 MILES THE SHORTEST!**

To St. Joseph, Atchison, Hiawatha, Waterville, Weston, Leavenworth,

**64 MILES THE SHORTEST!**

To Kansas City, Fort Scott, Lawrence, Ottawa,

Garnett, Iola, Humboldt, Topeka, Burlingame, Emporia, Manhattan, Fort Riley, Junction City, Salina, Ellsworth, Hays, Sheridan, Olathe, Paola, Cherokee Neutral Lands, Baxter Springs, Santa Fe, New Mexico, and all Points on the KANSAS PACIFIC, and MISSOURI RIVER, FT. SCOTT & GULF R. R's, with which we connect at Kansas City Union Depot.

THIS BEING THE SHORTEST LINE AND QUICKEST, is consequently the cheapest; and no one that is posted thinks of taking any other Route from Chicago to reach principal points in

## Missouri, Kansas, Indian Territory, or New Mexico.

DAILY OVERLAND STAGES from west end Kansas Pacific Railway, for Pueblo, Santa Fe, Denver, and points in Colorado and New Mexico.

This is also a most desirable Route, via St. Joseph, to Brownsville, Nebraska City, Council Bluffs, and Omaha, connecting with the Union Pacific Railroad for Cheyenne, Denver, Salt Lake, Sacramento, San Francisco, and the Pacific coast.

**Through Tickets for Sale at all Ticket Offices.** Baggage Checked Through, and Omnibus Transfers and Ferriage avoided.

**P. B. GROAT, Gen. Ticket Agent.** HANNIBAL, Mo.
**GEO. H. NETTLETON, Gen. Supt.** HANNIBAL, Mo.

Old, Reliable, Air-Line Route!

# CHICAGO, ALTON & ST. LOUIS R. R.

*SHORTEST, QUICKEST AND ONLY DIRECT ROAD TO*

## Bloomington, Springfield, Jacksonville, Alton,

— AND —

# ST. LOUIS!

WITHOUT CHANGE OF CARS.

THE ONLY ROAD MAKING IMMEDIATE CONNECTIONS AT ST. LOUIS WITH MORNING AND EVENING TRAINS

—FOR—

## ATCHISON, LEAVENWORTH, KANSAS CITY,

Lawrence, Topeka, Memphis, New Orleans,

And All Points South and Southwest.

☞ TRAINS leave CHICAGO from the West-side Union Depot, near Madison Street Bridge. ☜

| | |
|---|---|
| EXPRESS MAIL, [Except Sundays] | 8:10 A. M. |
| LIGHTNING EXPRESS, [Except Saturdays and Sundays] | 9:50 P. M. |
| NIGHT EXPRESS, [Daily] | 6:00 P. M. |
| JOLIET ACCOMMODATION, [Except Sundays] | 4:40 P. M. |
| JACKSONVILLE EXPRESS, [Daily] | 6:00 P. M. |

Trains arrive at Chicago at 8.00 P. M., 8.30 A. M. and 6:00 A. M. Joliet Accom., 9.40 A. M.

This is the ONLY LINE Between CHICAGO & ST. LOUIS RUNNING

## Pullman's Palace Sleeping and Celebrated Dining Cars!

BAGGAGE CHECKED THROUGH.

**Through Tickets** can be had at the Company's office, No. 55 Dearborn street, Chicago, or at the Depot, corner of West Madison and Canal streets, and at all principal Ticket Offices in the United States and Canada. Rates of Fare and Freights as low as by any other Route.

**A. NEWMAN, Gen. Pass. Agent.** **J. C. McMULLIN, Gen. Supt.**

# North Missouri R. R.

PASSENGERS FOR

## KANSAS AND THE WEST,

ARE REMINDED THAT

THE NORTH MISSOURI R. R.

—IS—

**11 MILES SHORTER than any other Route!**

BETWEEN

St. Louis and Kansas City.

**15** Miles Shorter between ST. LOUIS and LEAVENWORTH

— AND —

**49 MILES SHORTER TO ST. JOSEPH!**

THAN ANY OTHER LINE OUT OF ST. LOUIS.

☞ Three Through Express Trains Daily! ☜

Pullman's Celebrated Palace Sleeping Cars on all Night Trains!

☞ FOR TICKETS, apply at all Railroad Ticket Offices, and see that you get your Tickets via St. Louis and North Missouri Railroad.

**C. N. PRATT, Gen. Eastern Agt.,** 111 Dearborn-st. CHICAGO.
**S. H. KNIGHT, Gen. Superintendent,** ST. LOUIS.

JAS. CHARLTON, Gen. Pass. and Ticket Agt., St. Louis.

# Pacific Railroad of Missouri.

THE MOST DIRECT AND RELIABLE ROUTE FROM ST. LOUIS THROUGH TO

## KANSAS CITY, LEAVENWORTH & ATCHISON,

☞ WITHOUT CHANGE OF CARS! ☜

Close Connections at KANSAS CITY with Missouri Valley, Missouri River, Ft. Scott & Gulf, and Kansas Pacific R'ys, for Weston, St. Joseph, Junction City, Fort Scott, Lawrence, Topeka, Sheridan, Denver, Fort Union, Santa Fe, and

**ALL POINTS WEST!**

☞ At SEDALIA, WARRENSBURG and PLEASANT HILL, with Stage Lines for Warsaw, Quincy, Bolivar, Springfield, Clinton, Osceola, Lamar, Carthage, Granby, Neosho, Baxter Springs, Fort Gibson, Fort Smith, Van Buren, Fayetteville, Bentonville.

**PALACE SLEEPING CARS on all NIGHT TRAINS.**

**Baggage Checked Through Free!**

THROUGH TICKETS for sale at all the Principal Railroad Offices in the United States and Canadas. **Be Sure and Get your Tickets over the PACIFIC R. R. OF MISSOURI.**

**W. B. HALE,** Gen. Pass. and Ticket Agt.
**THOS. McKISSOCK,** General Superintendent.

**THREE HOURS IN ADVANCE OF ALL OTHER ROUTES!**

# Sixty-One Miles the Shortest Line! Only 27 Hours!

— FROM —

# CHICAGO TO NEW YORK.

# Pittsburgh, Ft. Wayne & Chicago and Pennsylvania Central

IS THE ONLY ROUTE RUNNING ITS ENTIRE TRAIN THROUGH TO PHILADELPHIA AND NEW YORK, AND THE ONLY ROUTE RUNNING

THREE DAILY LINES OF PULLMAN'S DAY AND SLEEPING PALACES,

— FROM CHICAGO TO —

# PITTSBURGH, HARRISBURG, PHILADELPHIA & NEW YORK

☞ WITHOUT CHANGE! ☜

WITH BUT ONE CHANGE TO

## BALTIMORE, PROVIDENCE, NEW HAVEN,

## HARTFORD, SPRINGFIELD, WORCESTER AND BOSTON!

And the Most Direct Route to Washington City.

☞ Trains Leave WEST SIDE UNION DEPOT, corner West Madison and Canal Streets, as follows:

| LEAVE: | Mail | Fast Express. | Pacific Exp. | Night Exp. | VALPARAISO ACCOMMODATION Leaves CHICAGO daily, (except Sunday,) at 4.50 P. M. |
|---|---|---|---|---|---|
| CHICAGO | 5.50 A. M. | 11.00 A. M. | 5.15 P. M. | 9.00 P. M. | |
| PLYMOUTH | 9.50 " | 1.50 P. M. | s. 9.10 " | 2.13 A. M. | |
| FORT WAYNE | 12.40 P. M. | 3.20 " | 11.30 " | B. 5.30 " | |
| LIMA | 3.15 " | .... " | 1.25 A. M. | 8.10 " | |
| FOREST | 4.37 " | .... " | 2.48 " | 9.40 " | |
| CRESTLINE | 6.00 A. M. | s. 6.55 " | 4.30 " | D 12.05 P. M. | |
| MANSFIELD | 6.42 " | 7.16 " | 5.00 " | 12.34 " | |
| ORRVILLE | 9.05 " | 8.42 " | 6.45 " | 2.27 " | |
| ALLIANCE | 10.45 " | 9.55 " | B. 8.40 " | 3.55 " | |
| ROCHESTER | D. 2.05 P. M. | 12.17 A. M. | 10.52 " | 6.02 " | |
| PITTSBURGH | 3.15 " | 12.50 " | 12.45 P. M. | s. 7.50 " | 5.30 A. M |
| BLAIRSVILLE BRANCH | 6.05 " | .... " | 2.49 " | 9.54 " | 7.23 " |
| JOHNSTOWN | 6.56 " | .... " | 3.37 " | 10.49 " | 8.08 " |
| CRESSON | 7.58 " | .... " | 4.38 " | 11.43 " | 9.04 " |
| ALTOONA | s. 9.05 " | B. 4.40 " | s. 5.45 " | 12.35 A. M. | B. 10.05 " |
| HUNTINGDON | 10.31 " | .... " | 7.04 " | 1.45 " | 11.14 " |
| LEWISTOWN | 11.44 " | .... " | 8.32 " | 2.59 " | 12.25 P. M. |
| HARRISBURG | 2.10 A. M. | 8.23 " | 10.45 " | 5.20 " | D. 2.50 " |
| LANCASTER | 3.40 " | .... P. M. | 12.15 A. M. | 7.00 " | 4.10 " |
| DOWNINGTON | 5.00 " | .... " | 1.40 " | B. 8.16 " | 5.35 " |
| **ARRIVE:** | | | | | |
| PHILADELPHIA | 6.30 " | 12.20 " | 3.10 " | 9.40 " | 7.00 " |
| NEW YORK, VIA PHILADELPHIA | 10.41 " | 3.00 " | 6.43 " | 1.00 P. M. | 10.26 " |
| NEW YORK, VIA ALLENTOWN | .. ..... | 3.50 " | ..... | 12.05 P. M. | ..... |
| BALTIMORE | ..... ..... | 12.10 " | 4.20 " | 9.00 A. M. | 7.00 " |
| WASHINGTON | ..... | 3.40 " | 5.50 " | 1.00 P. M. | 10.00 " |
| BOSTON | 9.00 P. M. | 5.50 A. M. | 5.05 P. M. | 11.50 " | ..... |

**THE FAST EXPRESS** Leaves Chicago daily, except Sunday; the entire Train,—Baggage, Day and Pullman's Palace Cars—RUNNING THROUGH from Chicago to New York, via Mantua Junction; leaves Pittsburgh daily, except Monday. This train **reaches NEW YORK in time to make close connection for BOSTON!** No other Route through New York makes it! Arrives in BALTIMORE **Five Hours,** and WASHINGTON **Four Hours in Advance of Rival Routes!**

**THE PACIFIC EXPRESS** Leaves Chicago and Pittsburgh daily, for Philadelphia and New York, with PULLMAN PALACE CARS from Chicago; leaves Harrisburg for Baltimore daily, except Sunday; has SLEEPING CARS from Chicago to Pittsburgh, and from Altoona to Philadelphia. This train arrives in BALTIMORE **Nine Hours,** and WASHINGTON **Seven Hours, in Advance of all other Lines!**

**THE NIGHT EXPRESS** Leaves Chicago daily, except Saturday and Sunday; leaves Pittsburgh daily, except Sunday; leaves Harrisburg for Baltimore daily; has PULLMAN'S PALACE CARS from Chicago to Philadelphia and New York; has SLEEPING CARS from Chicago to Crestline, and from Pittsburgh to New York, Philadelphia and Baltimore. This train reaches BALTIMORE **Three Hours in Advance of competing Routes!**

**THE MAIL** Leaves Chicago daily, except Sunday, stopping at all Stations, and reaching Crestline the same evening [where passengers can transfer to Day Express]; leaves Crestline [Express,] the next morning, and leaves Pittsburgh daily, except Sunday. SLEEPING CARS from Pittsburgh to Philadelphia.

**THE SOUTHERN EXPRESS** Leaves PITTSBURGH daily, except Monday, with SILVER PALACE CARS to Philadelphia and New York; leaves Harrisburg for Baltimore daily, except Sunday.

**BOSTON AND NEW ENGLAND PASSENGERS will find this Route especially Desirable, as it Gives them an opportunity of Seeing the FINEST VIEWS AMONG THE ALLEGHANY MOUNTAINS,**

Besides Visiting PITTSBURGH, PHILADELPHIA and NEW YORK, without extra cost!

All New England Passengers holding Through Tickets, will be Transferred, with their Baggage, to Rail and Boat Connections in NEW YORK, WITHOUT CHARGE.

## Close Connections Made at Lima for all Points on the Dayton & Mich. and Cin., Hamilton & Dayton R'ys

**And at CRESTLINE, for CLEVELAND, ERIE, DUNKIRK, BUFFALO, NIAGARA FALLS, and all Points reached via Lake Shore R.R.**

**THROUGH TICKETS for sale at the Company's Offices, at 65 Clark St., and also at 52 Clark St.; cor. Randolph and Wells St.; at N. E. corner of Randolph and LaSalle Sts.; and at Depot, Chicago. Also at Principal Ticket Offices in the West.**

F. R. MYERS, Gen. Pass. and Ticket Agt, P. & F. W. R'y, Chicago. W. C. CLELAND, Gen. Western Pass. Agt, P. Ft. W. & C. R'y, Chicago

T. L. KIMBALL, Gen. Western Pass. Agent, Penn. Central R. R., Chicago.

J. H. LINVILLE, PRESIDENT. J. L. PIPER, GEN. MANAGER. A. G. SHIFFLER, SUP'T & TREAS.

## The Keystone Bridge Company

OF PITTSBURGH, PENN.

Office and Works, 9th Ward, Pittsburgh, Pa. Philadelphia Office, 426 Walnut Street.

**GENERAL WESTERN OFFICE:—13 Fullerton Block, 94 Dearborn St., CHICAGO, ILL.**

☞ This Company possess unrivaled facilities for manufacturing and erecting every description of **Iron and Wooden Railway and Road Bridges, Roofs, Turn-Tables and Buildings, "Linville and Piper" Patent Iron Bridges, Self-Sustaining Pivot Bridges, Suspension Bridges, and Ornamental Park Bridges.** Contractors for Wooden or Iron Bridges of any pattern, as per plans and specifications. Circulars sent on application.

WALTER KATTE, ENGINEER. A. D. CHERRY, SECRETARY.

## PITTSBURGH CAST STEEL SPRING WORKS.

## A. French & Co.,

Manufacturers of Extra Tempered, Light Elliptic

## CAST STEEL SPRINGS,

FOR RAILROAD CARS AND LOCOMOTIVES,

*FROM BEST CAST STEEL.*

OFFICE AND WORKS:—Cor. Liberty and 21st Sts., PITTSBURGH, PA.

**CHICAGO BRANCH, 88 Michigan Ave.**

## Broad Gauge! Double Track!

# ERIE RAILWAY.

**4 EXPRESS TRAINS DAILY!**

From Cleveland, Dunkirk and Buffalo, 625 Miles, to New York, WITHOUT CHANGE of Coaches!

☞ The Trains of this Railway are run in DIRECT CONNECTION WITH ALL WESTERN AND SOUTHERN LINES, for

**Elmira, Williamsport, Oswego, Great Bend, Scranton, Newburgh,**

## NEW YORK, ALBANY, BOSTON, PROVIDENCE,

AND PRINCIPAL NEW ENGLAND CITIES.

**New and Improved DRAWING ROOM COACHES are attached to the DAY EXPRESS Running THROUGH TO NEW YORK.**

☞ **SLEEPING COACHES, Combining all Modern Improvements,** with perfect Ventilation and the peculiar arrangements for the comfort of Passengers incident to the **BROAD GAUGE,** accompany all night trains to New York.

**CONNECTIONS CERTAIN!** as Trains on this Railway will, when necessary, **wait from one to two hours for Western trains.**

All Trains of Saturday run directly Through to New York.

☞ **Ask for Tickets via Erie Railway,** which can be procured at **66 Clark Street,** Chicago, and at all Principal Ticket offices in the West and Southwest.

**L. D. RUCKER,** Gen'l Superintendent, New York. | **A. J. DAY,** Western Passenger Agent, Chicago. | **WM. R. BARR,** Gen'l Passenger Agent, New York.

# LAKE SHORE
— AND —
# MICHIGAN SOUTHERN R.W.

THE GREAT THROUGH LINE BETWEEN

## CHICAGO, BUFFALO & NEW YORK,
WITHOUT CHANGE!

AND THE ONLY RAILWAY

RUNNING PALACE COACHES THROUGH!

— BETWEEN —

## CHICAGO & NEW YORK, via BUFFALO

☞ WITHOUT TRANSFER OF PASSENGERS! ☜

**All Trains Stop at Twenty-Second Street to Take and Leave Passengers. Baggage Checked at that Station for all Points East.**

**4 EXPRESS TRAINS DAILY,** [Sundays Excepted,] Leave Chicago from the New Depot, on Van Buren St., at the head of La Salle Street, as follow s

**7:30 A. M.** MAIL TRAIN.
VIA OLD ROAD AND AIR LINE. SUNDAYS EXCEPTED.

Leaves 22d Street 7:15 A. M. Stops at all Stations. **Arrives**—Toledo, 6:20 P. M.

**11:30 A. M.** SPECIAL NEW YORK EXPRESS,
-A AIR LINE. SUNDAYS EXCEPTED.

Leaves—Twenty-Second Street, **11:45 A. M.** **Arrives**—Elkhart, 2:55 P. M.; Cleveland 10:40 P. M.; Buffalo, 4:10 A. M.; New York, 5:30 P. M.; (Chicago Time) Boston, 11:45 P. M.

**This Train has PALACE SLEEPING COACH Attached, Running**

THROUGH TO ROCHESTER, WITHOUT CHANGE!

**IN DIRECT CONNECTION WITH**

Wagner's Celebrated Drawing-Room Coaches on N. Y. Central R. R.

Only Thirty Hours, Chicago to New York!

**5:15 P. M.** ATLANTIC EXPRESS (Daily),
VIA OLD ROAD.

Leave—Twenty-Second Street **5:30 P. M.** **Arrives**—Laporte, 8:10 P. M. (Stops 20 minutes or Supper); arrives at Toledo, 2:50 A. M.; Cleveland, 7:25 A. M. (20 minutes for Breakfast); arrives at Buffalo, 1:50 P. M.; Rochester, 5:10 P. M. (20 minutes for Supper); connects with **Sleeping Coach running Through from Rochester to Boston Without Change,** making but **One Change between Chicago and Boston.**

**NEW AND ELEGANT SLEEPING COACH Attached to this Train, Running THROUGH from CHICAGO TO NEW YORK WITHOUT CHANGE! Arrives at NEW YORK, 6:40 A. M.**

**9:00 P. M.** NIGHT EXPRESS
VIA AIR LINE. (DAILY EXCEPT SAT. & SUN.)

Leaves—Twenty-Second Street, **9:15 P. M.** **Arrives**—Toledo, 6:00 A. M. (20 minutes for Breakfast); arrives at Cleveland, 10:35 A. M.; Buffalo, 5:30 P. M.; New York, 11:00 A. M.; Boston, 3:50 P. M.

## KALAMAZOO DIVISION.

Leave Chicago 11:30 A. M. Arrive at Kalamazoo 5:30 P. M.; Grand Rapids, 8:15 P. M.

Leave Chicago 9:00 P. M. Arrive at Kalamazoo 7:10 A. M.; Grand Rapids, 10:20 A. M.

**Elkhart Accommodation leaves Chicago, 3:30 P. M. Arrives at Elkhart, 8:20 P. M.**

☞ There being no heavy grades to overcome, or mountains to cross, the road bed and track being the smoothest and most perfect of any railway in the United States, this Company run their trains at a high rate of speed with perfect safety.

☞ Travelers who wish to SAVE TIME and make SURE CONNECTIONS, purchase Tickets via

## LAKE SHORE & MICHIGAN SOUTHERN R'Y.

THE ONLY LINE RUNNING THROUGH BETWEEN CHICAGO AND BUFFALO, WITHOUT TRANSFER, and in Direct Connection with NEW YORK CENTRAL RAILROAD and ERIE RAILWAY.

**General Ticket Office for Chicago, No. 56 Clark Street.**

**CHAS. F. HATCH,**
General Superintendent, CLEVELAND, OHIO.

**F. E. MORSE,**
General Western Passenger Agent, CHICAGO.

# ILLINOIS CENTRAL RAILROAD.

PASSENGER TRAINS LEAVE CHICAGO FROM THE GREAT CENTRAL DEPOT, FOOT OF LAKE ST.

## ST. LOUIS AND CHICAGO
THROUGH LINE.

**9:30 A. M.** DAY EXPRESS Sundays Ex,
Arriving in ST. LOUIS at 10:15 P. M.

☞ This Train Reaches St. Louis ONE HOUR & FIFTEEN MINUTES in Advance of any other Route! ☜

**8:30 P. M.** FAST LINE. Saturdays Excepted.
Arriving at ST. LOUIS at 8:00 A. M.

AT ST. LOUIS, Direct Connections are Made FOR

Jefferson City, Sedalia, Pleasant Hill, Macon, Kansas City,

## LEAVENWORTH, ST. JOSEPH & ATCHISON,

—Connecting at KANSAS CITY for—

LAWRENCE, TOPEKA, JUNCTION CITY, SALINA, SHERIDAN, &c.

## CAIRO, MEMPHIS AND NEW ORLEANS LINE.

**9:30 A. M.** CAIRO MAIL, Sundays Excepted.
Arriving at **Cairo** 2:30 A. M., **Memphis** 12:40 P. M., **Mobile** 9:40 A. M. **Vicksburg** 9:30 A. M., **New Orleans** 11:10 A. M.

**8:30 P. M.** CAIRO EXPRESS, Except Saturdays.
Arriving at **Cairo** 3:15 P. M., **Memphis** 2:30 A. M., **Vicksburg** 5:00 P. M., **New Orleans** 1:30 A. M.

**4:55 P. M.** CHAMPAIGN PASSENGER,
Arriving at **Champaign** at 11:15 P. M.

☞ THIS IS THE ONLY DIRECT ROUTE TO

Humboldt, Corinth, Grand Junction, Little Rock, Selma, Canton, Grenada, Columbus, Meridian, Enterprise,

## MEMPHIS, VICKSBURG, NEW ORLEANS & MOBILE.

At NEW ORLEANS, connections are made for

GALVESTON, INDIANOLA,

And all Parts of Texas.

☞ **NOTICE.—This Route is from 100 to 150 MILES SHORTER, and from 12 to 24 HOURS QUICKER than any other.**

THIS IS ALSO THE ONLY DIRECT ROUTE TO

## DECATUR, TERRE HAUTE, VINCENNES & EVANSVILLE.

## Peoria and Keokuk Line.

**9:30 A. M.** KEOKUK PASSENGER, Sun. Excepted.
Arriving at **Chenoa** 3:15 P. M., **El Paso** 4:05 P. M., **Peoria** 5:40 P. M., **Canton** 7:14 P. M., **Bushnell** 8:59 P. M., **Keokuk** 11:26 P. M., **Warsaw** 12:05 A. M.

## Elegant Drawing Room Sleeping Cars

ATTACHED TO ALL NIGHT TRAINS.

## Spacious and Fine Saloon Cars!

WITH ALL MODERN IMPROVEMENTS, RUN UPON ALL TRAINS.

**BAGGAGE CHECKED THROUGH TO ALL IMPORTANT POINTS.**

☞ For Through Tickets, Sleeping Car Berths, Baggage Checks, and information, apply at the office of the Company in the Great Central Depot, foot of Lake St.

## *Hyde Park and Oakwoods Train.*

| | LEAVE. | ARRIVE. | | LEAVE. | ARRIVE. |
|---|---|---|---|---|---|
| HYDE PARK TRAIN,... | *6:20 A. M. | *7.45 A. M. | HYDE PARK TRAIN,.... | *3:00 P. M. | *5:15 P. M. |
| HYDE PARK TRAIN... | *8:00 A. M. | *9.15 A. M. | HYDE PARK TRAIN,.... | *6:10 P. M. | *7:35 P. M. |
| HYDE PARK TRAIN,.. | *12:10 P. M. | *1:50 P. M. | | | |

* Sundays Excepted.

**W. P. JOHNSON, Gen. Pass. Agent.** **M. HUGHITT, Gen. Supt.**

# 1870. Great Central Route! 1870.

## SPEED! COMFORT! SAFETY!

# MICHIGAN CENTRAL and GREAT WESTERN RAILWAYS!

The Great Central Route, via Niagara Falls, to

## NEW YORK AND NEW ENGLAND.

## Pullman's Magnificent Palace Drawing-Room Cars,

— FROM —

## CHICAGO TO NEW YORK CITY, WITHOUT CHANGE.

**4 PASSENGER TRAINS LEAVE CHICAGO, DAILY EXCEPT SUNDAY.**
(DEPOT, FOOT OF LAKE STREET,) as Follows:

**5:00 A. M.** MAIL TRAIN. Stops at all Stations.
(SUNDAYS EXCEPTED.) Arrives DETROIT at 5:40 P. M.

**11:30 A. M.** SPECIAL NEW YORK & BOSTON EXP.
(SUNDAYS EXCEPTED.) Arrives at Michigan City 1:13 P. M.; New Buffalo 1:33, Niles 2:15, [Dinner], Kalamazoo 3:52 P. M.; Battle Creek 4:28, Marshall 4:48, Jackson 5:45, Detroit 7:55, London 12:05, A. M. Hamilton 2:35 A. M; Toronto 9.30, Suspension Bridge 3:55, Rochester 7:00 A. M; Albany, 2:00 P. M.; NEW YORK, 6:25, BOSTON, 11:50 P. M. ☞ This train connects at ROCHESTER (7:00 A. M.) with

**Wagner's Magnificent Palace Drawing-Room Cars!**

☞ RUNNING THROUGH TO NEW YORK, WITHOUT CHANGE! ☜

**5:15 P. M.** ATLANTIC EXPRESS.
(DAILY.) Arrives at Michigan City, 7:18 P. M.; Niles 8:30 P. M. [Supper]; Kalamazoo, 10:25 P. M.; Jackson, 1:00 A. M.; Detroit 3:40, London, 8:35, [Breakfast]; Hamilton 11:40, Suspension Bridge 1:30 P. M.; Rochester 5:00 P. M.; Albany, 1:30 A. M.; NEW YORK, 6:40 A. M.; BOSTON, 11:00 A. M.
A MAGNIFICENT DRAWING-ROOM SLEEPING CAR is attached to this train daily, FROM CHICAGO TO NEW YORK CITY. The celebrated

☞ **Hotel Drawing-Room Car is also attached to this Train from Chicago to Rochester!** ☜

☞ These, together with **ELEGANT DAY CARS TO SUSPENSION BRIDGE,** make this Train the favorite Train for all points East.

**SPECIAL NOTICE.**—Boston and New England Passengers will please notice that this Train now makes direct connection through. A SLEEPING CAR is attached at Rochester at 5.20 P. M., running through to Springfield, Mass., thus avoiding transfer at Albany. Breakfast at Springfield. This Train reaches Springfield early enough second morning to **Connect with all Trains** up and down the Connecticut.

**9:00 P. M.** NIGHT EXPRESS.
(SAT. & SUN. EXCEPTED). Arrives at Michigan City, 11:03 P. M.; Niles, 12:25 A. M.; Kalamazoo, 2:00; Marshall, 3:12; Jackson, 4:25; Grand Trunk Junction, 7:00; Detroit, 7:30; London, 1:45 P. M.; Hamilton, 4:35; Toronto, 9:35; Niagara Falls, 6:15; Buffalo, 7:15 P. M.; Rochester, 9:10; Syracuse, 12:25 A. M.; Rome, 1:55; Utica, 3:25; Albany, 6:30 A. M.; NEW YORK, 10:00 A. M.; BOSTON, 3:40 P. M.

**PULLMAN'S PALACE SLEEPING CARS ARE ATTACHED TO THIS TRAIN FROM CHICAGO TO DETROIT,**
And from Suspension Bridge to New York.

**WE INVITE THE ATTENTION OF THE TRAVELER to the SPLENDID EQUIPMENTS of this FIRST-CLASS LINE TO THE EAST!**

☞ FOR THROUGH TICKETS, and any and all information, Sleeping Car accommodations, &c., apply at General Office in Tremont House Block, at office in Great Central Depot; also at No. 60 Clark street, under Sherman House; at Grand Trunk Railway Office, 48 Clark street, or at New York Central Railroad Office, No. 53 Clark street, and at office under Briggs House.

H. E. SARGENT, Gen. Supt. M. C. R. R. W. K. MUIR, Gen. Supt. Gt. Western R. W. HENRY C. WENTWORTH, Gen. Pass. Agt.

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# CHICAGO, INDIANAPOLIS & LOUISVILLE

## THROUGH LINE!

—VIA—

## MICHIGAN CENTRAL RAILROAD.

THE ONLY ROUTE TO

## TO LOUISVILLE, WITHOUT CHANGE OF CARS.

TWO EXPRESS TRAINS Leave Chicago Depot, Foot of Lake as Follows:

**9:00 A. M.** MORNING EXPERSS.
(Except Sunday.) Arriving at LaFayette, 2:25 P. M.; Indianapolis, 6:00 P. M.; Louisville, 11:30 P. M.

**4:30 P. M.** AFTERNOON EXPRESS.
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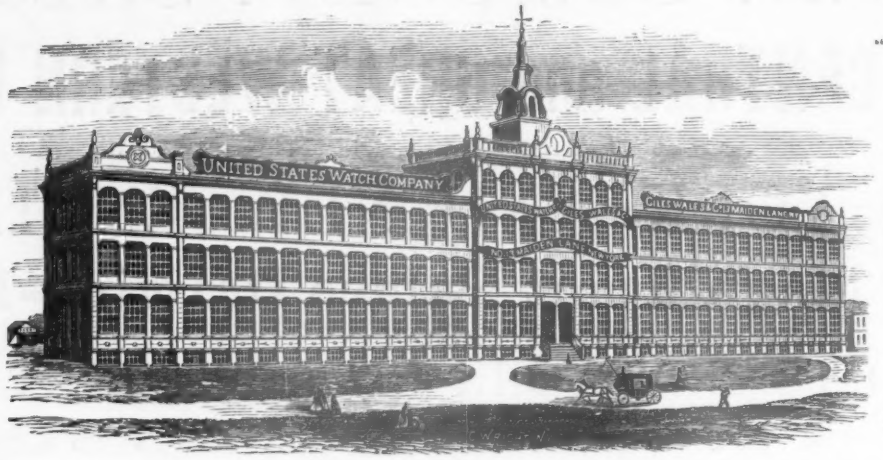


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Late Register U. S. Treasury.
NEW YORK, Jan. 17, 1870.

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STEM WINDING WATCH No. 1835, bearing Trade Mark, "Frederic Atherton, Marion, New Jersey," manufactured by United States Watch Co., has been carried by me two years, its total variation from mean time being hardly perceptible.
S. M. MOORE,
S. M. Moore & Co., Chicago.

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WATCH No. 1233, bearing Trade Mark, "Frederic Atherton & Co., Marion, New Jersey," manufactured by the United States Watch Co., has been carried by me eighteen months, its total variation from mean time being less than half a minute during the entire time. ELIJAH SMITH,
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WATCH No. 1,216, bearing Trade Mark, "Frederic Atherton & Co., Marion, New Jersey," manufactured by the United States Watch Co., has been carried by me a year, its total variation from mean time being about five seconds a month.
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WATCH No. 2248, bearing Trade Mark, "Fayette Stratton," manufactured by the United States Watch Co., has been carried by me one year, its total variation from mean time being only a trifle, and its performance has been entirely satisfactory, being by all odds the most accurate time-keeper I have ever carried. S. P. ROUNDS,
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Chicago, Bur. & Quincy Railroad.

THE watch bought of you has been carried by me eighteen months, its total variation from mean time being scarcely perceptible.
Yours truly, J. McGREGOR ADAMS,
Crerar, Adams & Co., Chicago.

THE Three Stem Winding Gold Watches purchased of you for my daughters and their friend, have proved very close time keepers and given entire satisfaction. J. L. PICKARD,
Supt. Public Instruction, Chicago.

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Ogden, Sheldon & Co., Chicago.

WATCH No. 2798, bearing Trade Mark, "Fayette Stratton, Marion, New Jersey," manufactured by United States Watch Co., has been carried by me six months, its total variation from mean time being only six seconds.
JOHN M. WOOLHOUSE,
Conductor C. & N. W. R'y, Chicago.

STEM WINDING WATCH No. 1225, bearing Trade Mark, "Frederic Atherton & Co., Marion, New Jersey," manufactured by the United States Watch Co., has been carried by me one year its total variation from mean time being only two seconds a month. The watch is by far the best watch I have ever carried or handled. J. F. WARREN,
Of J. F. Warren & Co., 173 Randolph-st., Chicago.

DES MOINES, July 21, 1870.
Messrs. GILES, BRO. & Co.
I take pleasure in saying that the watch I bought of you, being No. 21707, "Fayette Stratton, Marion, New Jersey," made by the United States Watch Co., has given me perfect satisfaction, its total variation from mean time, since regulated, being scarcely perceptible. Yours, etc.,
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